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ROYAL AIRCRAFT ESTABLISHMENT  
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**AN ANTHROPOMETRIC  
SURVEY OF 200 R.A.F. AND  
R.N. AIRCREW AND THE  
APPLICATION OF THE DATA  
TO GARMENT SIZE ROLLS**

by

R. E. Simpson

C. B. Bolton

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MINISTRY OF TECHNOLOGY  
FARNBOROUGH HANTS

R O Y A L   A I R C R A F T   E S T A B L I S H M E N T

Technical Report 67125

July 1968

AN ANTHROPOMETRIC SURVEY OF 200 R.A.F. AND R.N. AIRCREW  
AND THE APPLICATION OF THE DATA TO GARMENT SIZE ROLLS

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SUMMARY

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An anthropometric survey of limited scope was undertaken in October and November 1966, involving 200 Royal Air Force and Royal Navy aircrew. The 44 measurements taken on each subject were mainly those used in the drafting of patterns for the R.A.E. experimental range of aircrew functional garments. The acquired data have been tabulated and presented primarily for functional clothing sizing purposes. Tables and graphs are also included which give the data in a form suitable for use in aircrew work-space studies etc. Comparisons are made between specimen garment size-rolls for the 200 subjects based on chest girth/torso hoop, chest girth/stature and weight/stature as control parameters.

An analysis of the data supports the recommendation that size-rolls for one-piece garments in which a good torso fit is essential should be based on two direct body measurements, such as chest girth and torso hoop, rather than include one or more indirect measurements like weight or stature in the control parameters.

The data indicate that if one-piece garment torso fit is not important it is better logistically to use chest/stature or weight/stature as controls for garment sizing.

From the experience gained during this survey, suggestions are made regarding measuring techniques and procedures which should prove useful in a larger scale survey which is recommended.

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## 1 INTRODUCTION

The opportunity was taken to obtain 44 measurements on each of 200 R.A.F. and R.N. aircrew during the Phantom Aircrew Equipment fitting trials, held at the R.A.F. Institute of Aviation Medicine, in October and November 1966.

This information was required to provide realistic data for the derivation of preliminary size-rolls for aircrew protective garments<sup>1</sup> under development in the Human Engineering Division of Engineering Physics Department, R.A.E. It was also needed to substantiate previous recommendations<sup>2</sup> for the basing of one-piece garment size-rolls on two direct control dimensions, such as chest girth and torso hoop (vertical trunk circumference), rather than including an indirect measurement such as height or weight as a control.

This Report deals mainly with the collection, presentation and application of anthropometric data required for the production of close fitting functional garments. It does, however, include additional data on measurements such as sitting height, arm reach etc. which have direct application in aircrew working environment studies.

A review of previous anthropometric surveys of U.K. aircrew<sup>3</sup> has indicated that the information is sufficiently dated as to have dubious relevance to present aircrew. Even if national differences between U.S.A. and U.K. aircrew could be ignored, the more recent data on U.S.A. aircrew anthropometry<sup>4</sup>, has not been presented in a form suitable for use by clothing designers. An additional major shortcoming of all available data, in relation to current R.A.E. clothing development, is the omission of many of the specific body dimensions required. These dimensions, although not conventional tailoring measurements, are used in the formularised pattern drafting system<sup>2</sup>, in which body-related key dimensions are directly applied to the working patterns.

This pilot survey provided an opportunity to acquire information on these missing dimensions and to give the measuring team first hand experience of the problems involved in measuring a large number of subjects, and processing the resulting data.

The measuring techniques and apparatus described have been evolved over the past few years to provide, with very little operator training, a high standard of accuracy and repeatability in the measurement of the human body.

The survey sample of 200 men was dictated by the Phantom trials and is smaller than would have been chosen. However, the largest standard deviation in the linear measurements taken was 2.707 inches with a standard error of 0.135 inch. The standard error of the mean over all subjects in the worst case is, by calculation, 0.191 inch.

For the purpose of this Report the 200 subjects have been assumed to be a random sample. The data have already been used elsewhere to adjust the sizes and tariff of flying clothing for the U.K. Phantom aircraft.

The data relating to the sub-groups determined by various pairs of control dimensions are, because of their smaller size and hence decreased statistical significance, used mainly to illustrate a recommended approach to one-piece garment sizing.

A glossary of the statistical terms used in this Report is included at Appendix A.

## 2 MEASURING APPARATUS

A measuring rig (Fig.1a) for taking vertical and horizontal linear dimensions of the subjects was designed and constructed prior to this survey. It is similar to the Morant board in that it is based on a floor and two walls mutually at right angles but does not use the half inch square grid pattern as scales. It was thought that greater accuracy would be obtained from the use of a traversing vertical scale upon which was mounted a measuring head having datum edges which could be aligned with that part of the body being measured.

The measuring head (Fig.1b) is itself free to move up and down the vertical scale and the position of the datum edges can be read directly as a distance from floor and vertical end wall. The scales are graduated in inches and the travelling portions carry vernier scales graduated in tenths of inches. Body dimensions can thus be read easily to the nearest 0.1 inch.

For hygienic reasons the working surfaces of the two rig walls have been re-constructed with a plastic laminate facing and to prevent complaints of cold feet from the subjects the floor has been cork faced.

The complete rig can be readily dismantled and folded and is transportable so that it may be used by travelling anthropometric survey teams.

Circumferential measurements were made by hand using  $\frac{3}{8}$  inch wide glass-cloth measuring tapes.



A daily check was made on the accuracy of the measuring rig and tapes. The former was maintained within  $\pm 1/16$  inch over the measuring range both horizontally and vertically and the latter started and remained approximately 0.1 inch short on 60 inches. Checking was done using a steel rule as a standard.

### 3 MEASUREMENTS AND MEASURING PROCEDURE

A small work study was undertaken prior to the preparation of the recording proforma (Fig.2) to determine the most convenient sequence of measuring. Despite this precaution, it was found, as the survey proceeded, that some small changes in the sequence would have further increased convenience and, possibly, speed. Once the measuring routine had become familiar to the operators the time per subject for the taking of 44 dimensions was about 16 minutes.

The dimensions taken were as listed on the proforma and in addition to age, weight and shoe size, covered 41 other measurements. These consisted of 20 linear dimensions for which the rig was used and 21 girths involving the use of the measuring tapes. During measuring with the tapes, tension was maintained sufficiently to keep the tape from slipping without causing marked flesh indentation. On the tapering body sections care was taken to align the appropriate measuring edge of the tape with the girth plane required.

Because of the smallness of the errors in the measuring apparatus, all dimensions were recorded as taken, rounded off to the nearest 0.1 inch, without correcting for apparatus errors.

Photographs showing the method of taking each of the measurements are inset at Tables 1 to 41 inclusive.

A few dimensions relating to wrist and ankle taper and the associated datum planes were required specifically for pressure/immersion seal sizing and location for a special development garment. These particular dimensions would not be perpetuated in future surveys, and the more usual ankle and wrist datum planes would be substituted. The thigh pivot referred to in this Report was taken as the crest of the prominence at the head of the femur. Allowance has been made for the displacement of this datum from the thigh joint axis when applying the data to pattern drafting. The location of the knee joint axis could possibly be omitted in future surveys as the acquired data shew it can be fairly well defined as a function of knee height - sitting.

Of the 44 recorded dimensions, Table 51 indicates, by means of a symbol, those which have been used by R.A.E. for direct application to functional garment patterns. The dimensions which have not previously been taken on anthropometric surveys or, if taken, have not been done in a manner having direct application to the R.A.E. pattern drafting system are also indicated in this Table by means of an alternative symbol.

Prior to taking the measurements of each subject certain datum points were located and marked (Fig.3) with an eyebrow pencil. This procedure greatly aided the taking of heights such as waist, knee pivot, suprasternum etc. and enabled over shoulder measures to be made at a standard distance of  $3\frac{1}{4}$  inches from the body centreline. The shoulder datum points and upper wrist and ankle seal girth positions were located by means of plastic templates and the main wrist and ankle datum circumferences were located, before marking, by means of  $\frac{1}{2}$  inch wide fabric bands. The waist line was similarly located by settling a  $\frac{1}{2}$  inch wide fabric belt firmly at the subject's waist and marking at convenient intervals on each side of the belt. Subsequent measurements were made at this circumference with the belt removed; waist height and half torso hoop measurements were taken at the belt width centre.

Before commencement of measuring, the subjects were asked to adopt an upright but relaxed stance i.e. not standing stiffly to attention. For the measuring of sitting height etc., where the subject was seated, a similarly relaxed but upright posture was adopted.

The procedure followed for the survey was for two measurers only to take turns at measuring and recording. The recorder observed closely all measurements and on occasion was able to correct what would otherwise have been a mis-measurement. The situation of the table used by the recorder and the form of the measuring apparatus were such that the recorder was himself able to read the measurement as a check on the measurer. This routine helped to ensure the maintenance of accuracy in what rapidly became a rather tedious task even for operators with a direct personal interest in the survey data.

Subjects were measured wearing only their own underpants. The variety of style and material, from thin cellular "continental briefs" to thick flannelette trunks, was sufficient to make a difference of about 0.7 inch in measuring over the buttocks and an attempt was made to allow for this in the recording.



Most men have a pronounced taper from chest to waist and this causes some difficulty in measuring chest circumference accurately as small changes in the height at which the measurement is made have considerable effect on the girth. The datum height chosen was horizontal through the nipples and measurement was done from the front of the subject. Care had to be taken to ensure that the tape had not slipped down at the back. It is recommended that the chest girth be taken using a mirror behind the subject so that it is easy to see that the tape does not slip down (see illustration with Table 1).

Potential sources of error were found in the variation of stance between subjects and movement during the taking of measurements. It is therefore important that the operators have sufficient interest and ability to recognise and correct artificialities of stance before taking measurements.

The chest girth measurement, which is likely to be most in error for these reasons and which may be one of the defining variables for garment sizing was taken twice, at the commencement and towards the end of the measuring sequence. If there was a difference of more than  $\frac{1}{4}$  inch between the first measure (which was jotted down on scrap paper) and the second, the recorder requested a remeasure and the chest girth measurement was repeated until both operators were satisfied that they had an accurate measure. A rough check on the torso hoop was afforded by summing the two half hoops taken near the end of the measuring sequence.

Some subjects were measured more than once as a check on repeatability of measurement by the same operator and as a comparison of performance between the two operators who shared the task of measuring. The operators were not aware of which subjects would be remeasured, the choice being made randomly by O.C. Trial without reference to any other person. Unfortunately time pressed too heavily to permit as many remeasures as would have been liked, particularly in the early weeks of the Trial. However, it is thought that the checking done is enough to give reasonable confidence in the accuracy and repeatability of the anthropometric data presented in this Report. Typical remeasure results are shown in Table 54.

Repetition of lengthy verbal instructions to each subject regarding attitude and positioning in the rig would largely have been avoided had coloured, or numbered, footprints been painted on the baseboard and silhouettes on the walls where subjects were required to stand.

#### 4 PRESENTATION OF DATA

The measurements of each subject were recorded on a proforma and subsequently transferred to punched cards for use on sorting and computing machinery.

The fashion of printing a percentile table for each of the separate dimensions has been followed. These are given at Tables 1 to 50 inclusive and include mean, standard deviation, coefficient of variation and range. The standard errors are bracketed after these values. Such presentation is, however, of little use by itself in the sizing of clothing where a complete individual has to be fitted. Trivariate tables have therefore been compiled in which the individuals were sorted into arbitrary groups based on each of the following three pairs of control dimensions:

- (i) chest girth - torso hoop (vertical trunk circumference)
- (ii) chest girth - stature
- (iii) weight - stature

These trivariate tables, given at Tables 51, 52 and 53 respectively, record the minimum, maximum, mean and standard deviation of all dependent variables for sub-groups based on specified increments of the particular control parameters.

Chest girth - torso hoop control sizing has been used for a range of experimental aircrew functional clothing at R.A.E. Fig.4a shows a preliminary 9 sized roll, based on these controls, superimposed on a chest/torso hoop plot of the 200 survey subjects. The increments of chest girth and torso hoop defining the sizing rectangles are based on acceptable garment clearances derived from earlier work. The main dimensions of the 9 theoretical "men" in this chest/torso hoop based size-roll are listed at Table 55. These were determined by taking the maximum circumferences and mean lengths in each size block from Table 51.

The more conventional sizing parameters of chest/stature and weight/stature on which Tables 52 and 53 have been based are shown plotted for each subject at Figs.4b and 4c respectively. The increments of chest girth, stature and weight defining the sizing rectangles shown superimposed on these plots have been selected to provide a nine-size coverage equivalent to that adopted for the preliminary size-roll based on chest girth and torso hoop control dimensions (Fig.4a).



The effect on the range of the dependent subject measurements of using the three different pairs of control parameters can be seen by comparing equivalent sizes in Tables 51, 52 and 53. For convenience, the range variation for some of the more important dimensions is listed separately at Table 56. The data in this latter table are taken from only eight of the nine sizes under each control grouping as the size 9 in each group includes too few subjects.

The range, mean, standard deviation and coefficient of variation of all the body measurements taken in this survey have been extracted and, for convenience, gathered into a single list at Table 57.

The relationship between certain pairs of body dimensions having significance in clothing sizing and human engineering studies is shown graphically together with the regression equations, correlation coefficients and covariances at Figs.5 to 18 inclusive.

Figs.19, 20, 21, 22 and 23 show respectively, the frequency distribution of stature, weight, torso hoop, chest girth and shoe size.

A comparison of some of the anthropometric data obtained from this survey with the data provided by the 1944 survey of British military aircrew<sup>3</sup> is given at Table 58.

## 5 DISCUSSION

### 5.1 General

Table 58 indicates that in the 22 year period between the Morant<sup>3</sup> and R.A.E. surveys of comparable British aircrew, significant changes have taken place.

The average age of aircrew has increased by  $5\frac{1}{2}$  years, weight by 19 pounds, stature by 1.17 inches, chest girth by 3.66 inches and waist girth by 4.14 inches. These changes are of considerable importance from the point of view of clothing size-rolls. They highlight the need for a larger survey to provide more statistically significant data, particularly for use in the preparation of trivariate tables such as are presented at Tables 51, 52 and 53.

### 5.2 Chest girth/torso hoop control for garment sizing

The implications of the use of chest girth and torso hoop as control measurements for one-piece garment sizing can be deduced from a study of Table 56, and comparison of Tables 51, 52 and 53. The range of torso hoop and chest girth dimensions for subjects within any of the arbitrary sizes

considered does not exceed 3 inches. Thus a good torso fit would be ensured, with close alignment of the garment and subject crotch line. The range of subject arm lengths within the sizing groups is little different from those to be accommodated within the equivalent sizes obtained by chest/stature or weight/stature control.

As would be expected from a control system in which a body length measurement (stature, shoulder height etc.) is not included, the range of leg lengths (crotch height) for any of the size groups is greater when using chest and torso hoop as the control dimensions.

Work in the Human Engineering Division of R.A.E. led to the adoption of the chest/torso hoop system of sizing for experimental pressure suits, where a good torso fit was of paramount importance. With these garments, limb length adjustment was practicable and to a large extent overcame limb sizing problems. This system of sizing has more recently been applied to an experimental aircrew overall to ensure good torso fit. In particular, it meets the need for an accurately aligned garment/subject crotch area to minimise the "hobbling" effect of a low garment crotch and its adverse effects on the positioning of thigh window pockets, leg-garter tunnels etc. when "drawn in" by seat/parachute crotch straps.

A theoretical fitting trial based on comparison of the dimensions of the 9 sizes of overall with those of the 200 survey subjects indicates that a satisfactory torso fit would be obtained on 95% but an acceptable fit as regards leg length would be obtained on only 65% to 75% of the subjects. As foreseen, there is a need for either two leg and, possibly, arm lengths for each torso size, making 18 sizes in all, or a method of limb length adjustment if 9 sizes are to be provided. Methods of limb length adjustment for this experimental overall are under investigation.

### 5.3 Chest girth/stature and weight/stature control

The more conventional chest/stature and weight/stature control methods of garment sizing have been considered together, as the implications of their use in determining garment size-rolls are similar. By including a body length dimension as one of the control measurements, the range of dependent body length dimensions for any one of the arbitrarily selected sizing groups listed at Table 56 is less than for chest/torso hoop control sizing. This is particularly true of the shoulder height dimension upon which garment lengths can be conveniently based. The maximum range of this dimension from the



subjects in the arbitrary size groups based on chest/stature and weight/stature controls is 4.8 inches and 4.0 inches respectively, against 9.9 inches for chest/torso hoop control.

A shortcoming of the chest/stature and weight/stature systems is the relatively poor torso hoop fit provided. The maximum range of subject torso hoop dimensions to be accommodated by any size in the specimen size-roll varies from 11.2 inches under chest/stature control to 7.5 inches under weight/stature control. Assuming a minimum garment torso clearance of 3.5 inches on the largest man in these size-blocks, the smallest man will have, respectively 14.7 inches and 11.0 inches excess garment girth around the nude torso hoop, with a resulting crotch drop of up to 7.35 inches and 5.5 inches. These are extreme cases for the greatest torso hoop range within a particular size but in the case of chest/stature control, the 11.2 inch torso girth range applies to the most populous size 5 grouping (28% of survey subjects).

If body fit is unimportant and ranges of subject shoulder height, of up to 4.8 inches and 4.0 inches can be accommodated satisfactorily within a particular garment size, the chest/stature and weight/stature methods of garment sizing are advantageous from the logistic viewpoint.

Of these two sizing methods, weight/stature control affords the better garment fit because of the generally smaller range of dependent subject measurements within comparable size-blocks.

## 6 CONCLUSIONS AND RECOMMENDATIONS

(i) The measuring apparatus and techniques used for this survey have given a high standard of accuracy and repeatability as indicated by the repeat measure data given at Table 54. It has been shown that these standards can be achieved with very little operator training.

(ii) To obtain the degree of torso fit considered desirable in one-piece aircrew functional clothing, sizing should be based on direct body measures (measurements actually fitted by clothing) rather than indirect measures such as height and weight. The data from this study support the use of chest girth and torso hoop as control parameters for this purpose.

(iii) If torso fit is unimportant it is better logistically to use chest girth/stature or weight/stature as the control measurements. Of these two, weight/stature control should afford the better general garment fit, based on the evidence of this survey.

(iv) There should be a larger scale anthropometric survey of British military aircrew in the near future to remedy the lack of up-to-date information. This information should be updated more frequently than hitherto.

(v) Any future surveys should include those dimensions specifically required for functional tailoring purposes, particularly those indicated in this Report as being not previously taken.

(vi) To make the international exchange of anthropometric data on military personnel meaningful for functional clothing purposes, standardisation of measurements taken, measuring techniques and methods of data presentation should be sought between the Commonwealth and N.A.T.O. nations.

(vii) For functional clothing purposes, survey results should be recorded and processed in a manner lending itself to the production of tables such as those given at Tables 51, 52 and 53 of this Report.

(viii) The experience gained from this preliminary survey has highlighted the following points:

(a) A thorough work study to determine the sequence of measuring most convenient to both measurer and subject is an essential preliminary of any future survey.

(b) Every endeavour should be made to avoid using uninterested personnel as either measurers or recorders.

(c) The more important or difficult measurements should be repeated during the measuring sequence, with sufficient time interval for the measurer to have forgotten the original figure.

(d) Periodic random remeasures and operator comparisons should be made as a check on accuracy and repeatability.

(e) Any clothing worn by the measured subjects for modesty purposes should be standardised. Drip dry briefs affording minimum and standard cover are suggested.

#### ACKNOWLEDGEMENTS

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## Appendix A

### GLOSSARY OF STATISTICAL TERMS AND SYMBOLS

#### Frequency distribution

If we consider the weights of a given collection of individuals, these can be arranged in categories. Thus there might be 17 individuals whose weight falls within the category 140 to 145 lb, 14 individuals in the 145 to 150 lb group and so on. This device for summarising information may be presented in graphical form when it is called a bar-chart or histogram.

With a large enough sample, collection, or population of individuals and a small enough weight interval, the broken outline of the bar-chart can be idealised as a continuous curve of frequency plotted against weight (the variable quantity). Then, instead of being limited to information on the number whose weights lie between certain fixed limits, we may consider the proportion of the whole population above or below a given weight or between any two weights under the curve.

In many cases this frequency curve or distribution is symmetrical. The symmetrical normal curve is a particularly important shape as it is often assumed to be a satisfactory way in which to approximate to the true frequency distribution of a population.

#### Percentile

The  $Q\%$  point, or the  $Q$ -percentile, of a frequency distribution is that value of the variable quantity ( $x$ ) below which  $Q\%$  of all values in the population lie.

#### Mean

The mean ( $\bar{x}$ ) of a distribution is the arithmetic average of all values of  $x$ . For the normal curve this is also the commonest value in the population.

#### Standard deviation

The standard deviation of a distribution is a measure of the variability of the quantity being studied:

$$s.d. = \sqrt{\frac{\sum (x - \bar{x})^2}{N}} .$$

It is useful to remember that, in the case of a normal distribution, approximately 68.2% of the values lie within  $\pm 1$  s.d. of the mean, 95.4% within  $\pm 2$  s.d. and 99.7% within  $\pm 3$  s.d. of the mean.

#### Coefficient of variation

This is a method of expressing the variability in a dimensionless form as the percentage given by:

$$\frac{\text{mean}}{\text{s.d.}} \times 100 \times \frac{\text{s.d.}}{\text{mean}}$$

#### Standard error

When the mean, standard deviation, or any other quality is measured for a sample of a population the result will vary with the sample used. The possible results of repeated sampling will themselves form a frequency distribution whose variability depends inversely on the sample size.

The standard deviation of this derived distribution is called the standard error of the mean, s.d., or other quality under consideration. In the case of a normal population the true value of the mean, s.d. etc., lies within  $\pm 1$  s.e. of the sample value on 68% of occasions, within  $\pm 2$  s.e. on 95% of occasions and etc.

#### Correlation coefficient

If two variables such as height (x) and weight (y) be measured for the individuals of a population there may be some correlation or dependence between them. The correlation coefficient is a dimensionless measure of this dependence and lies between -1 and +1. An exact linear relationship in which x and y increase together leads to the value +1, if x decreases as y increases the value would be -1. In general, relationships are not exact and the numerical value is less than 1. A value that is close to zero indicates little or no relationship between x and y.

#### Regression lines

When the relationship is not exact, then for a given x, the y values have a frequency distribution about a mean value Y. In the important special case where x and y are both normally distributed the regression line  $Y = a + bx$  gives this mean value of y for given x. By interchanging the roles of x and y in the definitions of a and b in the following formulae the (different) regression line  $X = a' + b'y$  gives the mean of the x values for a specified y value.

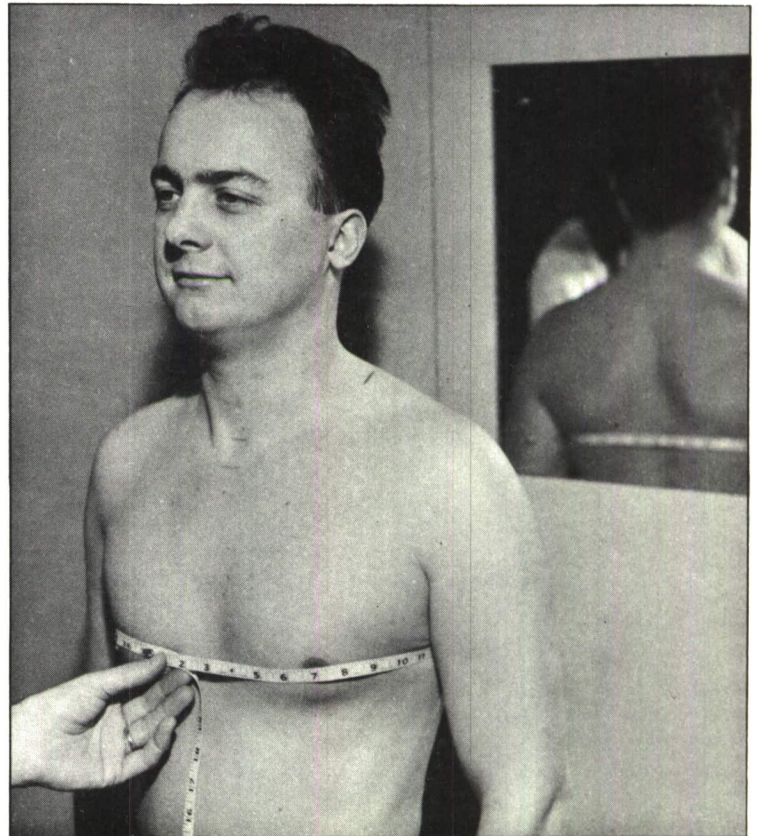
$x$	=	a basic size, number, unit, etc.
$N$	=	number of $x$ , size of sample or population
$\Sigma x$	=	the sum of $x_1 + x_2 + \dots + x_n$
$\bar{x}$	=	mean (arithmetic) or average = $\frac{\Sigma x}{N}$
$\Sigma  x - \bar{x} $	=	the sum of the differences, neglecting sign, of $x$ and $\bar{x}$
$\Sigma (x - \bar{x})^2$	=	the sum of the squares of the differences of $x$ and $\bar{x}$
$\sigma$	=	standard deviation = $\sqrt{\frac{\Sigma (x - \bar{x})^2}{N}}$
$v$	=	coefficient of variation = $\frac{\sigma}{\bar{x}} \times 100\%$
$SE_{\bar{x}}$	=	standard error of the mean = $\frac{\sigma}{\sqrt{N}}$
$SE_{\sigma}$	=	standard error of the standard deviation = $\frac{\sigma}{\sqrt{2N}}$
$SE_v$	=	standard error of coefficient of variation = $\frac{v}{\sqrt{2N}}$
$r$	=	correlation coefficient = $\frac{\Sigma (x - \bar{x})y}{\sqrt{\Sigma (x - \bar{x}) \times \Sigma (y - \bar{y})y}}$
$c$	=	covariance = $v \sigma_x \sigma_y$
$b$	=	regression slope = $\frac{\Sigma (x - \bar{x})y}{\Sigma (x - \bar{x})^2}$
$a$	=	regression intercept = $\bar{y} - b \bar{x}$
$\sigma^2$	=	variance = s.d. <sup>2</sup> = $\frac{\Sigma (x - \bar{x})^2}{N}$



Tape horizontal over nipples with subject breathing normally and standing in a relaxed manner.

# PERCENTILE VALUES

%	cm	in
min	86.36	34.00
1	86.36	34.00
2	87.63	34.50
3	88.65	34.90
5	89.41	35.20
10	91.06	35.85
15	92.29	36.33
20	92.91	36.58
25	93.75	36.91
30	93.98	37.00
35	94.74	37.30
40	95.50	37.60
45	96.56	38.01
50	96.98	38.18
55	97.54	38.40
60	98.47	38.77
65	99.01	38.98
70	100.08	39.40
75	101.60	40.00
80	103.12	40.60
85	104.27	41.05
90	105.92	41.70
95	107.95	42.50
97	109.98	43.30
98	111.76	44.00
99	112.78	44.40
max	116.59	45.90



Mean: 97.907 (0.408) cm; 38.546 (0.161) in.  
 Standard deviation: 5.773 (0.289) cm; 2.273 (0.114) in  
 Coefficient of variation: 5.897 (0.295) %  
 Range: 86.36–116.59 cm; 34.00–45.90 in  
 No. of subjects: 200

Table 1  
CHEST GIRTH

Record the average of the right and left hand torso hoops. For left hand hoop, tape to pass over left shoulder datum mark and to the left of the genitals when passed through the crotch; opposite for right hand hoop measure. Tape to span hollows and lie in the buttock crease, i.e. should not include buttock prominence.

PERCENTILE VALUES		
%	cm	in
min	144.53	56.90
1	146.05	57.50
2	150.37	59.20
3	151.13	59.50
5	153.16	60.30
10	155.45	61.20
15	156.15	61.48
20	157.42	61.98
25	158.41	62.37
30	159.38	62.75
35	161.16	63.45
40	162.31	63.90
45	163.12	64.22
50	163.77	64.47
55	164.63	64.82
60	165.61	65.20
65	166.24	65.45
70	166.88	65.70
75	167.98	66.13
80	168.66	66.40
85	169.93	66.90
90	172.21	67.80
95	175.01	68.90
97	175.77	69.20
98	176.28	69.40
99	177.04	69.70
max	185.93	73.20

Mean: 163.68 (0.468) cm; 64.44 (0.184) in  
Standard deviation: 6.619 (0.331) cm; 2.606 (0.130) in  
Coefficient of variation: 4.044 (0.202) %  
Range: 144.53–185.93 cm; 56.90–73.20 in  
No. of subjects: 200

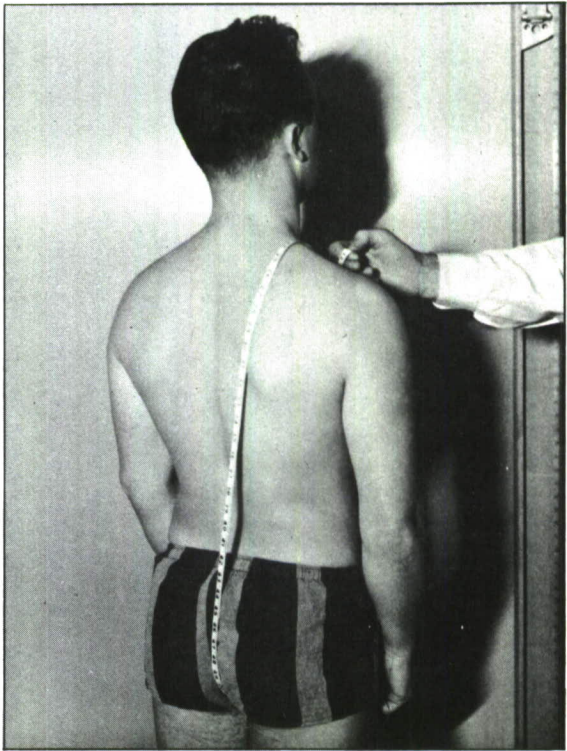
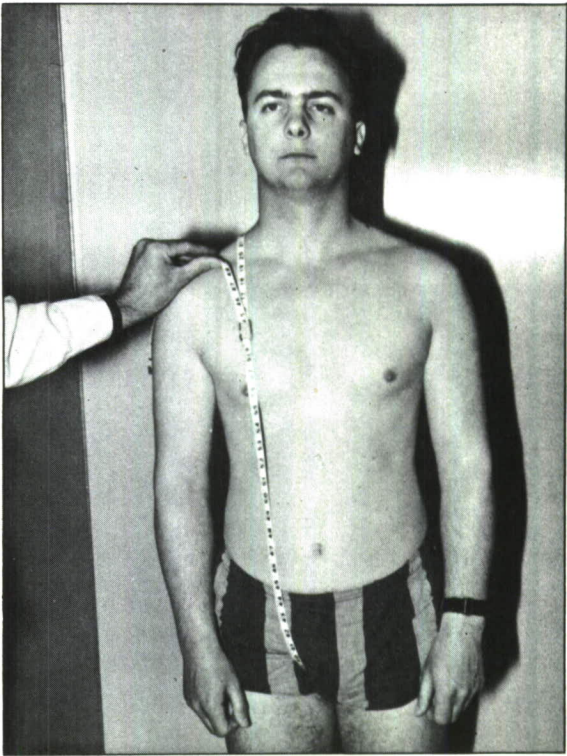


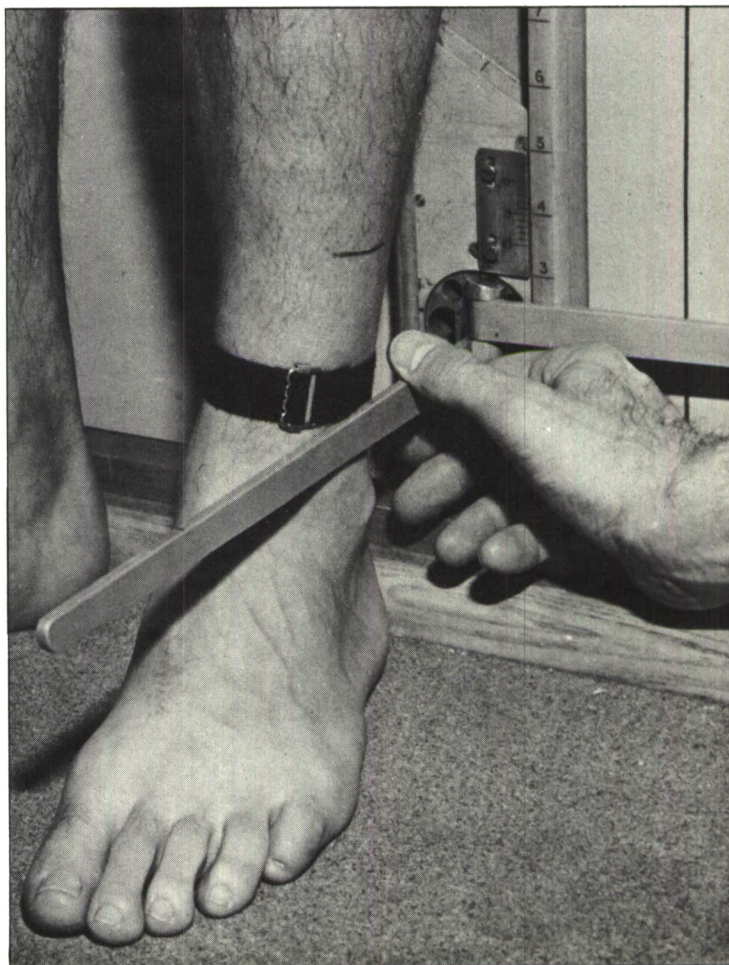
Table 2  
TORSO HOOP



Using the lower edge of an adjustable tape band to mark the minimum ankle girth, measure the height from floor datum.

# PERCENTILE VALUES

%	cm	in
min	10.16	4.00
1	10.16	4.00
2	10.41	4.10
3	10.77	4.24
5	11.18	4.40
10	11.48	4.52
15	11.64	4.58
20	11.88	4.68
25	12.04	4.74
30	12.17	4.79
35	12.29	4.84
40	12.41	4.89
45	12.50	4.92
50	12.59	4.95
55	12.67	4.99
60	12.76	5.03
65	12.87	5.07
70	12.98	5.11
75	13.10	5.16
80	13.23	5.21
85	13.41	5.28
90	13.61	5.36
95	13.90	5.47
97	14.22	5.60
98	14.39	5.67
99	14.73	5.80
max	14.99	5.90



Mean: 12.682 (0.061) cm; 4.993 (0.024) in  
 Standard deviation: 0.861 (0.043) cm; 0.339 (0.017) in  
 Coefficient of variation: 6.789 (0.339) %  
 Range: 10.16–14.99 cm; 4.00–5.90 in  
 No. of subjects: 200

Table 3  
 ANKLE – HEIGHT OF MINIMUM GIRTH

Locate the knee hinge point by feel and eye whilst subject gently swings lower leg to and fro to flex the joint.  
Mark the hinge point and measure its height from the floor datum.

PERCENTILE VALUES		
%	cm	in
min	42.16	16.60
1	43.94	17.30
2	44.96	17.70
3	45.72	18.00
5	46.31	18.23
10	47.06	18.53
15	47.43	18.67
20	47.88	18.85
25	48.41	19.06
30	48.89	19.25
35	49.19	19.37
40	49.45	19.47
45	49.73	19.58
50	49.93	19.66
55	50.18	19.76
60	50.47	19.87
65	50.66	19.94
70	50.86	20.02
75	51.36	20.22
80	51.71	20.36
85	52.01	20.47
90	52.58	20.70
95	54.36	21.40
97	55.12	21.70
98	55.37	21.80
99	56.39	22.20
max	57.66	22.70



Mean: 50.071 (0.170) cm; 19.713 (0.067) in  
Standard deviation: 2.398 (0.120) cm; 0.944 (0.047) in  
Coefficient of variation: 4.789 (0.239) %  
Range: 42.16–57.66 cm; 16.60–22.70 in  
No. of subjects: 200

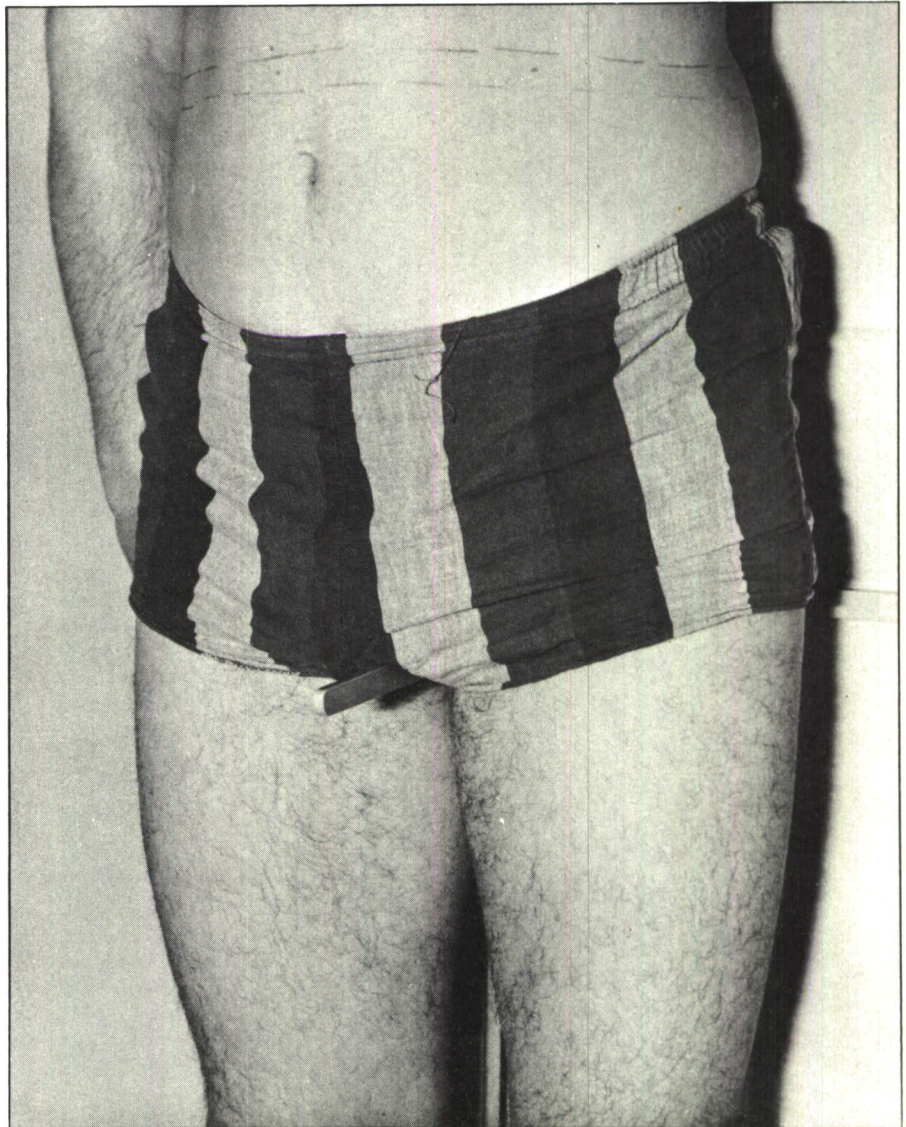
Table 4  
KNEE PIVOT HEIGHT



Place datum edge of lower arm of measuring head in light contact with the lowest point of crotch, avoiding genitals. Record datum edge height from floor datum.

# PERCENTILE VALUES

%	cm	in
min	72.39	28.50
1	73.15	28.80
2	73.66	29.00
3	74.42	29.30
5	76.12	29.97
10	77.72	30.60
15	78.61	30.95
20	79.63	31.35
25	80.07	31.53
30	80.67	31.76
35	81.03	31.90
40	81.53	32.10
45	82.04	32.30
50	82.76	32.58
55	83.06	32.70
60	83.48	32.87
65	84.33	33.20
70	84.80	33.39
75	85.15	33.52
80	86.11	33.90
85	87.43	34.42
90	88.39	34.80
95	89.15	35.10
97	90.93	35.80
98	92.96	36.60
99	93.47	36.80
max	97.03	38.20



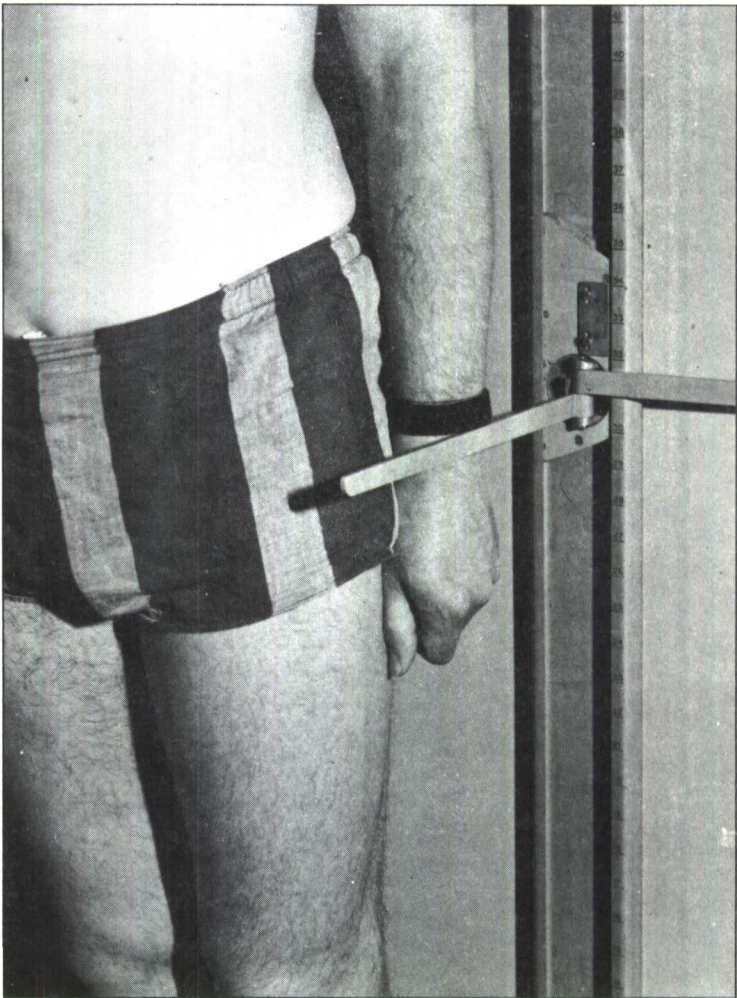
Mean: 82.926 (0.299) cm; 32.648 (0.118) in  
 Standard deviation: 4.227 (0.211) cm; 1.664 (0.083) in  
 Coefficient of variation: 5.097 (0.255) %  
 Range: 72.39–97.03 cm; 28.50–38.20 in  
 No. of subjects: 200

Table 5  
CROTCH HEIGHT

Using the lower edge of an adjustable tape band to mark the minimum wrist circumference above the styloid process, record the wrist datum height above the floor datum.

PERCENTILE VALUES

%	cm	in
min	79.25	31.20
1	79.50	31.30
2	80.77	31.80
3	81.15	31.95
5	82.04	32.30
10	83.57	32.90
15	84.50	33.27
20	85.17	33.53
25	85.94	33.83
30	86.30	33.98
35	87.12	34.30
40	87.69	34.52
45	88.28	34.76
50	88.65	34.90
55	88.97	35.03
60	89.31	35.16
65	89.75	35.33
70	90.30	35.55
75	91.36	35.97
80	91.95	36.20
85	92.64	36.47
90	93.34	36.75
95	95.12	37.45
97	95.63	37.65
98	96.01	37.80
99	96.77	38.10
max	99.82	39.30



Mean: 88.646 (0.274) cm; 34.900 (0.108) in  
Standard deviation: 3.876 (0.194) cm; 1.526 (0.076) in  
Coefficient of variation: 4.373 (0.219) %  
Range: 79.25–99.82 cm; 31.20–39.30 in  
No. of subjects: 200

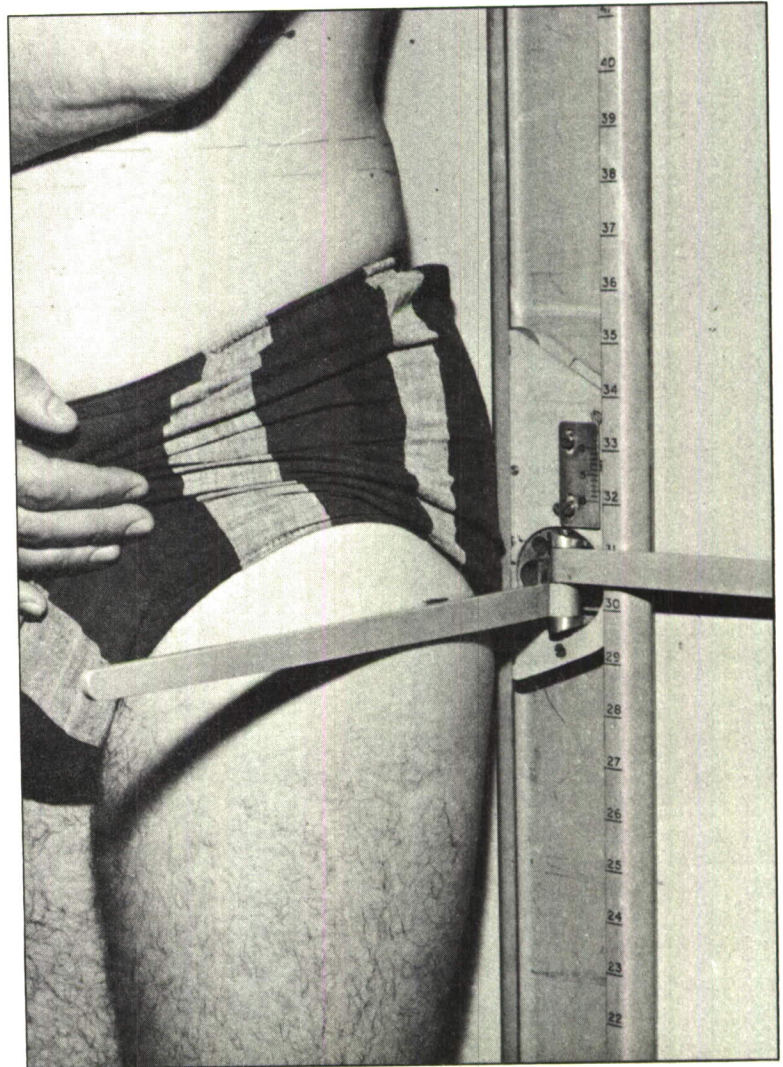
Table 6  
WRIST HEIGHT



Locate by feel and/or eye the prominence at the head of the femur, mark this position and align datum edge of measuring head with mark. Record height from floor datum on vertical scale. Location is sometimes simplified if subject flexes the joint.

## PERCENTILE VALUES

%	cm	in
min	78.99	31.10
1	80.52	31.70
2	81.28	32.00
3	82.04	32.30
5	82.55	32.50
10	84.29	33.19
15	85.39	33.62
20	86.19	33.93
25	87.17	34.32
30	87.95	34.62
35	88.34	34.78
40	89.15	35.10
45	89.62	35.28
50	90.06	35.46
55	90.46	35.61
60	90.88	35.78
65	91.44	36.00
70	92.33	36.35
75	92.81	36.54
80	93.19	36.69
85	93.85	36.95
90	94.84	37.34
95	96.77	38.10
97	97.79	38.50
98	98.81	38.90
99	100.33	39.50
max	106.17	41.80

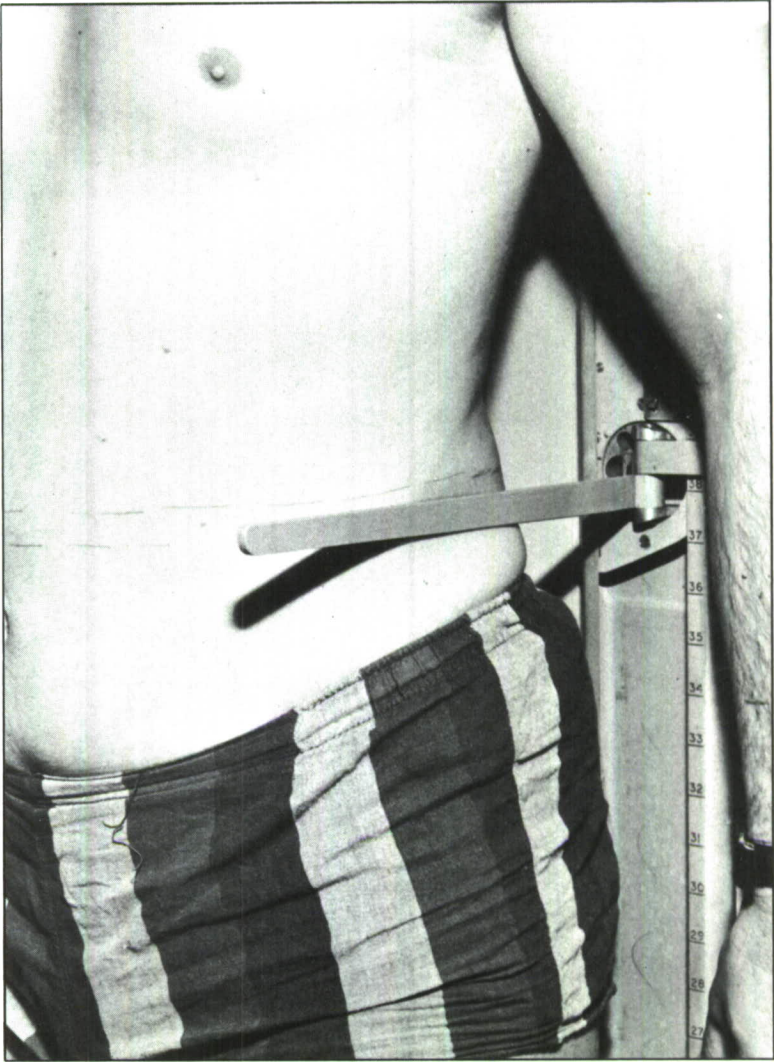


Mean: 90.056 (0.299) cm; 35.455 (0.118) in  
 Standard deviation: 4.227 (0.211) cm; 1.664 (0.083) in  
 Coefficient of variation: 4.693 (0.235) %  
 Range: 78.99–106.17 cm; 31.10–41.80 in  
 No. of subjects: 200

Table 7  
THIGH PIVOT HEIGHT

With the subject wearing a narrow adjustable belt in the natural waist, mark belt edge lines. Record height of centre line of belt width above floor datum.

PERCENTILE VALUES		
%	cm	in
min	97.03	38.20
1	97.54	38.40
2	97.92	38.55
3	99.06	39.00
5	99.72	39.26
10	102.11	40.20
15	103.63	40.80
20	105.11	41.38
25	105.92	41.70
30	106.63	41.98
35	107.14	42.18
40	108.24	42.61
45	108.71	42.80
50	109.12	42.96
55	109.60	43.15
60	110.17	43.38
65	110.74	43.60
70	111.19	43.77
75	112.14	44.15
80	113.16	44.55
85	113.88	44.83
90	115.32	45.40
95	117.60	46.30
97	118.49	46.65
98	119.63	47.10
99	121.16	47.70
max	124.97	49.20



Mean: 109.141 (0.359) cm; 42.969 (0.141) in  
Standard deviation: 5.072 (0.253) cm; 1.997 (0.100) in  
Coefficient of variation: 4.648 (0.232) %  
Range: 97.03–124.97 cm; 38.20–49.20 in  
No. of subjects: 200

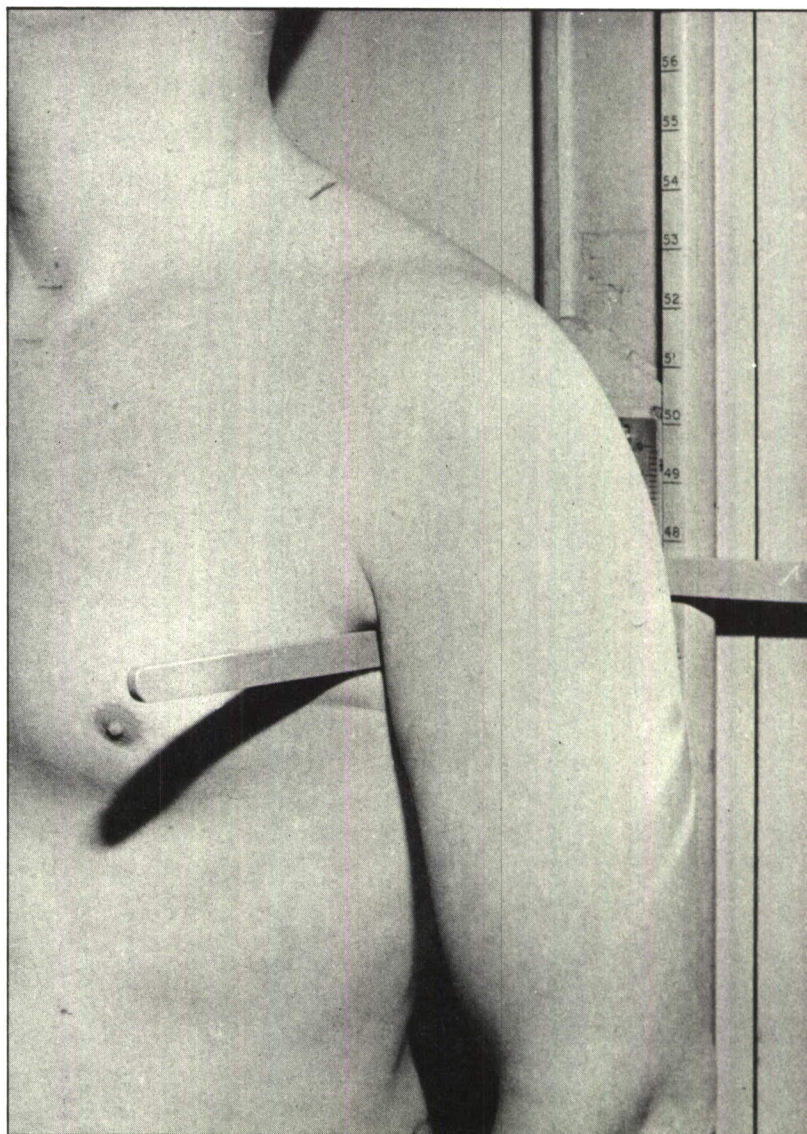
Table 8  
WAIST HEIGHT



With the subject's arm slightly away from side, raise the measuring head lower arm until its datum edge makes light contact with the low point of the armpit. Record height of datum edge above floor datum.

## PERCENTILE VALUES

%	cm	in
min	120.14	47.30
1	121.16	47.70
2	121.67	47.90
3	122.05	48.05
5	122.94	48.40
10	125.81	49.53
15	126.92	49.97
20	128.57	50.62
25	129.41	50.95
30	130.01	51.18
35	130.98	51.57
40	131.95	51.95
45	132.67	52.23
50	133.10	52.40
55	133.76	52.66
60	134.43	52.92
65	134.70	53.03
70	135.38	53.30
75	136.14	53.60
80	137.06	53.96
85	138.18	54.40
90	139.19	54.80
95	141.48	55.70
97	144.02	56.70
98	144.53	56.90
99	146.05	57.50
max	148.59	58.50

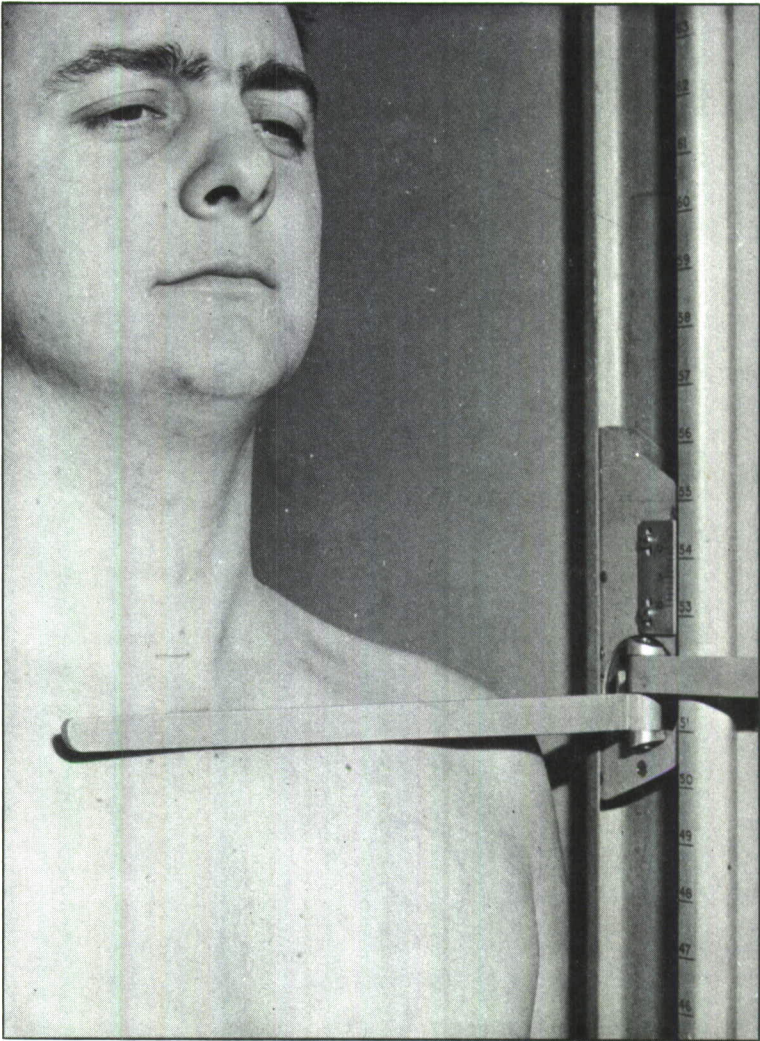


Mean: 132.994 (0.382) cm; 52.360 (0.150) in  
 Standard deviation: 5.403 (0.270) cm; 2.127 (0.106) in  
 Coefficient of variation: 4.062 (0.203) %  
 Range: 120.14–148.59 cm; 47.30–58.50 in  
 No. of subjects: 200

Table 9  
AXILLARY HEIGHT

Mark base of the hollow at top of the sternum and record height of mark from floor datum.

PERCENTILE VALUES		
%	cm	in
min	131.06	51.60
1	131.19	51.65
2	131.95	51.95
3	132.84	52.30
5	134.37	52.90
10	136.40	53.70
15	137.92	54.30
20	139.19	54.80
25	140.21	55.20
30	141.39	55.67
35	142.11	55.95
40	142.81	56.23
45	143.32	56.43
50	143.89	56.65
55	144.27	56.80
60	145.16	57.15
65	145.54	57.30
70	146.30	57.60
75	147.00	57.87
80	147.51	58.07
85	148.08	58.30
90	150.11	59.10
95	152.15	59.90
97	153.80	60.55
98	155.45	61.20
99	157.73	62.10
max	160.78	63.30



Mean: 143.79 (0.379) cm; 56.610 (0.149) in  
Standard deviation: 5.359 (0.268) cm; 2.110 (0.106) in  
Coefficient of variation: 3.727 (0.186) %  
Range: 131.06–160.78 cm; 51.60–63.30 in  
No. of subjects: 200

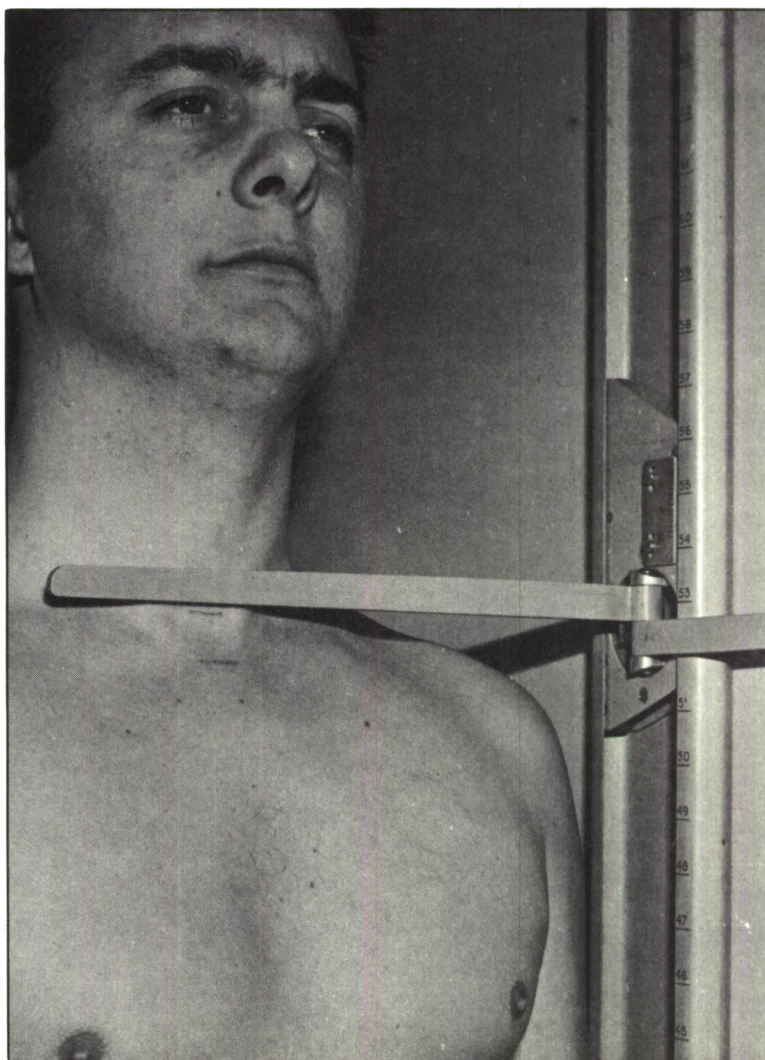
Table 10  
SUPRASTERNAL HEIGHT



Mark intersection of neck and chest (lower edge of normal collar band position) and record height of mark above floor datum.

# PERCENTILE VALUES

%	cm	in
min	132.84	52.30
1	133.10	52.40
2	134.87	53.10
3	135.25	53.25
5	136.65	53.80
10	138.68	54.60
15	140.29	55.23
20	141.67	55.77
25	142.24	56.00
30	143.64	56.55
35	144.36	56.83
40	144.97	57.07
45	145.59	57.32
50	146.20	57.56
55	146.68	57.75
60	147.37	58.02
65	147.98	58.26
70	148.67	58.53
75	149.35	58.80
80	149.75	58.96
85	150.62	59.30
90	152.53	60.05
95	154.43	60.80
97	156.04	61.43
98	157.73	62.10
99	160.15	63.05
max	163.07	64.20



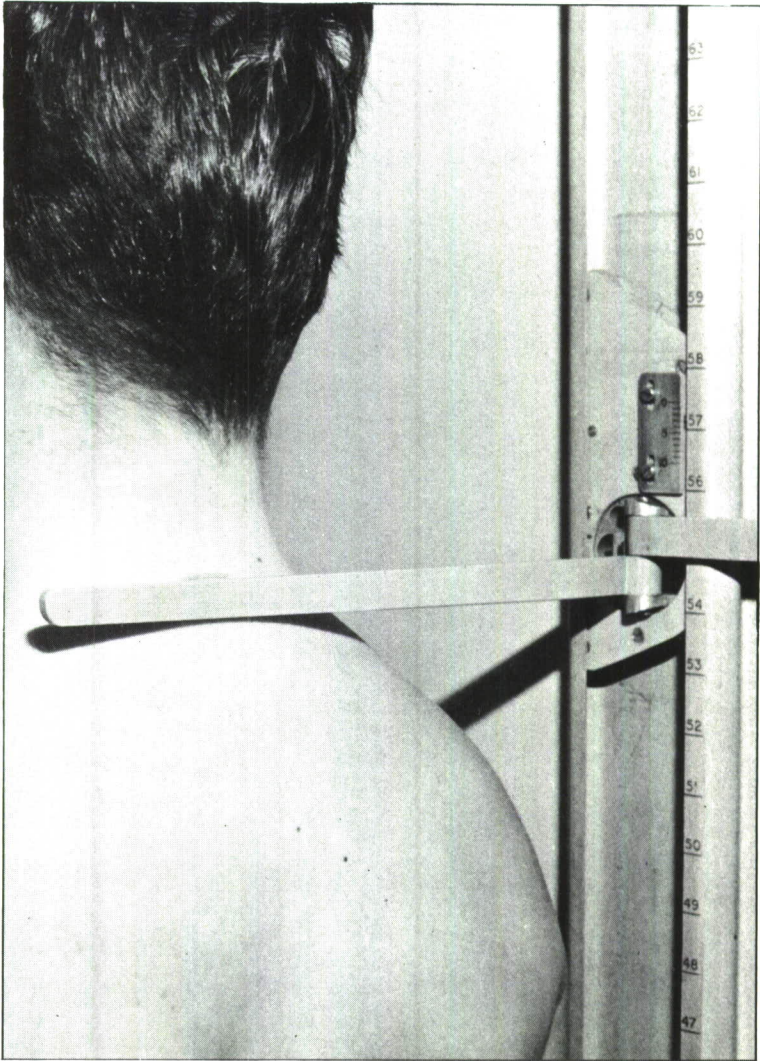
Mean: 146.068 (0.384) cm; 57.507 (0.151) in  
 Standard deviation: 5.425 (0.271) cm; 2.136 (0.107) in  
 Coefficient of variation: 3.714 (0.186) %  
 Range: 132.84–163.07 cm; 52.30–64.20 in  
 No. of subjects: 200

Table 11  
NECK ROOT HEIGHT

Mark the crest of the protuberance of the seventh cervical vertebra and record height from floor datum.

PERCENTILE VALUES

%	cm	in
min	137.16	54.00
1	137.92	54.30
2	139.19	54.80
3	140.21	55.20
5	141.48	55.70
10	143.45	56.48
15	145.80	57.40
20	147.07	57.90
25	148.00	58.27
30	149.10	58.70
35	150.11	59.10
40	150.83	59.38
45	151.49	59.64
50	151.84	59.78
55	152.32	59.97
60	152.87	60.18
65	153.54	60.45
70	154.48	60.82
75	155.28	61.13
80	156.27	61.52
85	157.53	62.02
90	159.00	62.60
95	160.53	63.20
97	163.07	64.20
98	163.32	64.30
99	164.34	64.70
max	169.67	66.80



Mean: 151.760 (0.408) cm; 59.749 (0.161) in  
Standard deviation: 5.773 (0.289) cm; 2.273 (0.114) in  
Coefficient of variation: 3.804 (0.190) %  
Range: 137.16–169.67 cm; 54.00–66.80 in  
No. of subjects: 200

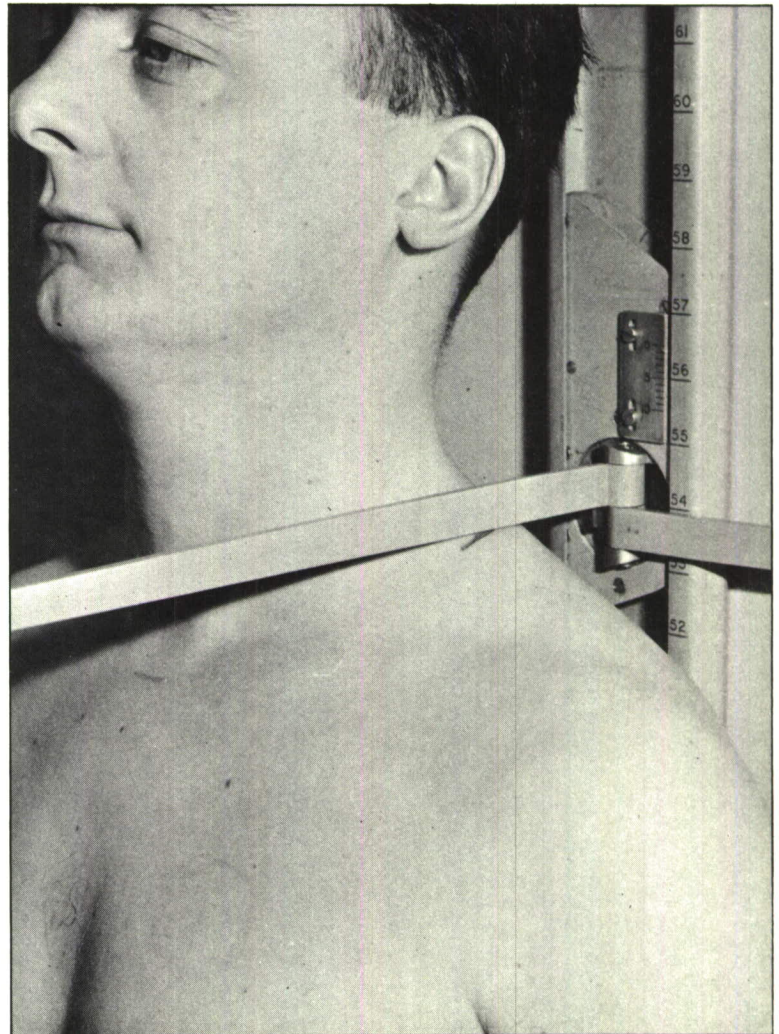
Table 12  
SEVENTH CERVICAL HEIGHT



Mark shoulder datum point  $3\frac{1}{4}$  inches out from body centreline and record height of datum mark above floor datum.

# PERCENTILE VALUES

%	cm	in
min	135.64	53.40
1	136.40	53.70
2	138.18	54.40
3	138.75	54.63
5	139.45	54.90
10	141.48	55.70
15	143.76	56.60
20	144.86	57.03
25	145.80	57.40
30	147.17	57.94
35	147.94	58.24
40	148.76	58.57
45	149.48	58.85
50	149.90	59.01
55	150.32	59.18
60	150.88	59.40
65	151.74	59.74
70	152.55	60.06
75	153.16	60.30
80	154.09	60.67
85	155.45	61.20
90	156.97	61.80
95	159.00	62.60
97	161.04	63.40
98	162.05	63.80
99	163.70	64.45
max	168.91	66.50



Mean: 149.862 (0.409) cm; 59.001 (0.161) in  
 Standard deviation: 5.786 (0.289) cm; 2.278 (0.114) in  
 Coefficient of variation: 3.861 (0.193) %  
 Range: 135.64–168.91 cm; 53.40–66.50 in  
 No. of subjects: 200

Table 13  
SHOULDER HEIGHT

With the subject standing comfortably erect, lower the upper arm of the measuring head until the datum edge is in light contact with the subject's head. Record height of datum edge from floor datum.

PERCENTILE VALUES		
%	cm	in
min	161.80	63.70
1	163.07	64.20
2	164.59	64.80
3	165.10	65.00
5	166.12	65.40
10	168.34	66.27
15	170.56	67.15
20	171.75	67.62
25	172.80	68.03
30	173.80	68.42
35	174.84	68.83
40	175.77	69.20
45	176.40	69.45
50	176.97	69.67
55	177.55	69.90
60	178.26	70.18
65	179.32	70.60
70	180.17	70.93
75	181.02	71.27
80	181.55	71.48
85	182.63	71.90
90	184.40	72.60
95	186.05	73.25
97	188.47	74.20
98	189.99	74.80
99	192.79	75.90
max	195.07	76.80



Mean: 176.959 (0.434) cm; 69.669 (0.171) in  
Standard deviation: 6.134 (0.307) cm; 2.415 (0.121) in  
Coefficient of variation: 3.466 (0.173) %  
Range: 161.80–195.07 cm; 63.70–76.80 in.  
No. of subjects: 200

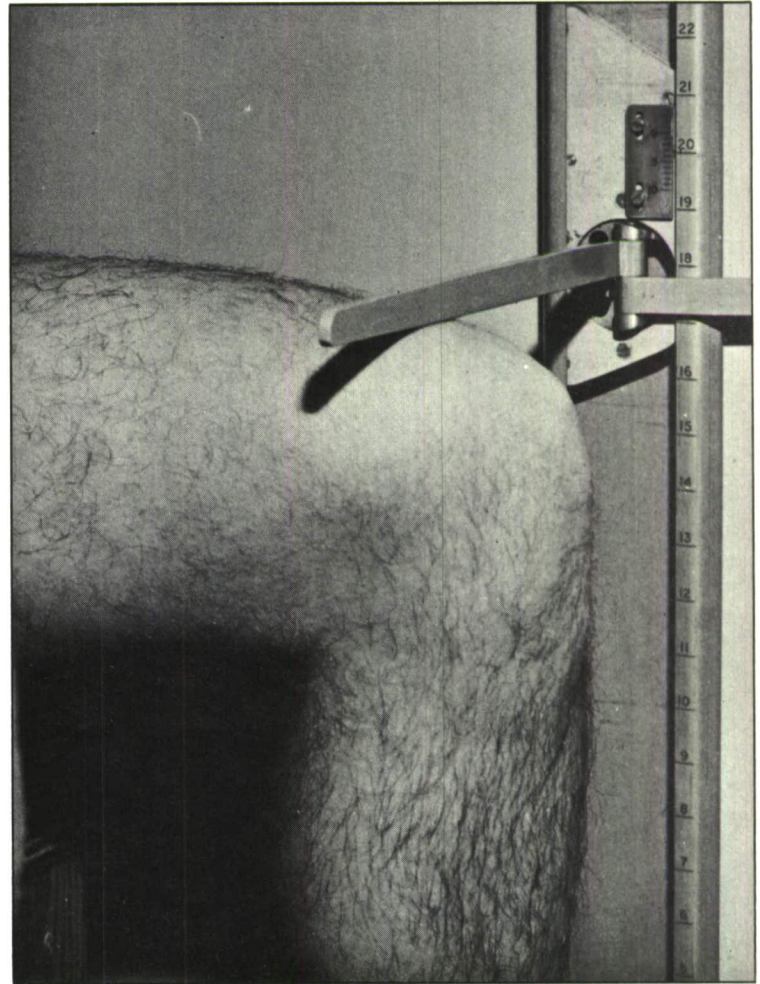
Table 14  
HEIGHT (STATURE)



With the subject seated, upper surface of thigh horizontal and shin vertical, lower the upper arm of the measuring head until datum edge is in light contact with top of knee, record height of datum edge above floor datum.

# PERCENTILE VALUES

%	cm	in
min	48.51	19.10
1	49.02	19.30
2	50.21	19.77
3	50.88	20.03
5	51.22	20.17
10	52.43	20.64
15	52.74	20.76
20	53.23	20.96
25	53.76	21.17
30	54.31	21.38
35	54.64	21.51
40	54.90	21.61
45	55.23	21.74
50	55.50	21.85
55	55.88	22.00
60	56.11	22.09
65	56.34	22.18
70	56.57	22.27
75	56.99	22.44
80	57.45	22.62
85	57.91	22.80
90	58.42	23.00
95	59.77	23.53
97	60.20	23.70
98	60.96	24.00
99	61.72	24.30
max	63.75	25.10



Mean: 55.608 (0.178) cm; 21.893 (0.070) in  
 Standard deviation: 2.515 (0.127) cm; 0.990 (0.050) in  
 Coefficient of variation: 4.522 (0.226) %  
 Range: 48.51–63.75 cm; 19.10–25.10 in  
 No. of subjects: 200

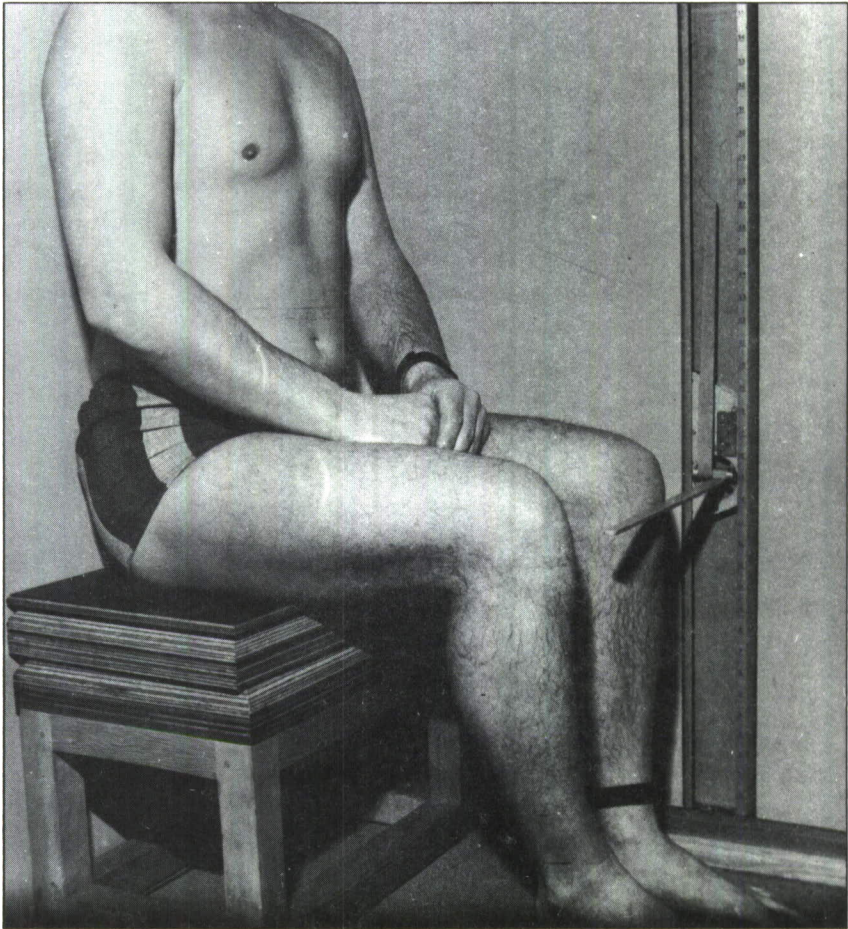
Table 15  
KNEE HEIGHT – SITTING



With subject seated, upper surface of thigh horizontal and buttocks firmly against datum wall, record distance of knee prominence from datum wall.

PERCENTILE VALUES

%	cm	in
min	53.85	21.20
1	54.23	21.35
2	55.37	21.80
3	55.71	21.93
5	56.13	22.10
10	57.36	22.58
15	57.88	22.79
20	58.58	23.06
25	59.01	23.23
30	59.28	23.34
35	59.51	23.43
40	59.73	23.51
45	60.09	23.66
50	60.76	23.92
55	61.02	24.02
60	61.21	24.10
65	61.50	24.21
70	61.79	24.33
75	62.10	24.45
80	62.55	24.62
85	63.25	24.90
90	64.39	25.35
95	65.40	25.75
97	65.91	25.95
98	66.29	26.10
99	66.67	26.25
max	68.07	26.80

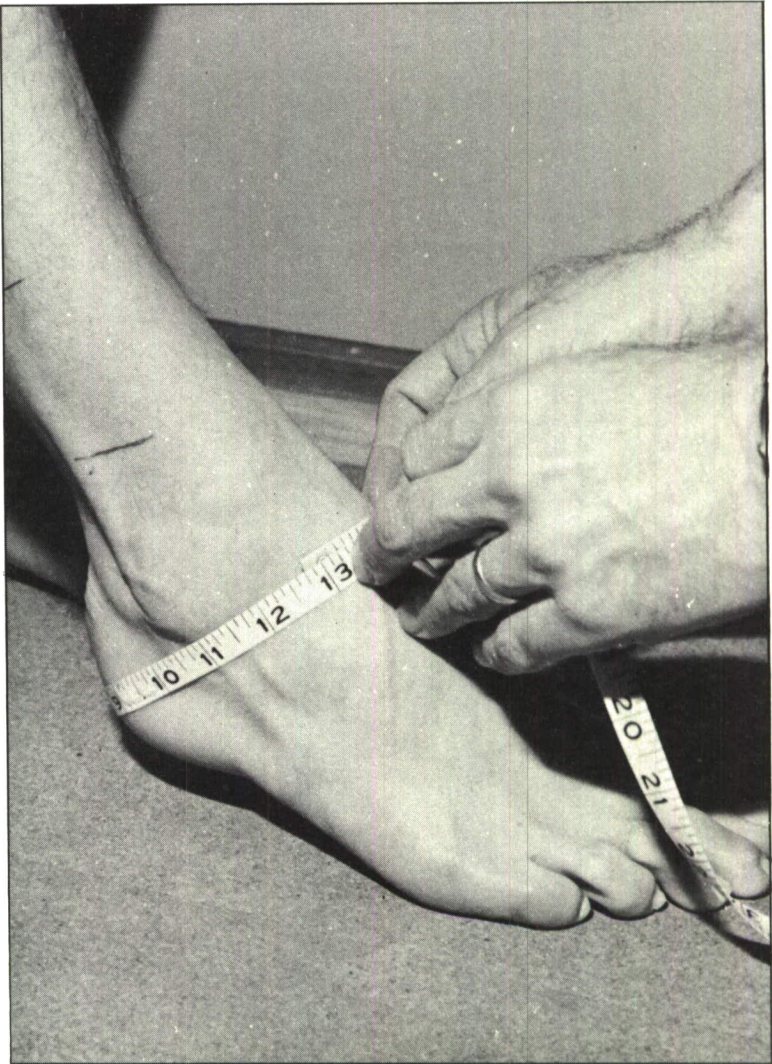


Mean: 60.762 (0.186) cm; 23.922 (0.073) in  
Standard deviation: 2.631 (0.132) cm; 1.036 (0.052) in  
Coefficient of variation: 4.330 (0.217) %  
Range: 53.85–68.07 cm; 21.20–26.80 in  
No. of subjects: 200

Table 16  
BUTTOCK TO KNEE LENGTH

With toe 'pointed', record girth over bulge of the heel.

PERCENTILE VALUES		
%	cm	in
min	29.21	11.50
1	29.97	11.80
2	30.23	11.90
3	30.35	11.95
5	30.61	12.05
10	30.99	12.20
15	31.31	12.33
20	31.64	12.46
25	31.85	12.54
30	32.00	12.60
35	32.20	12.68
40	32.38	12.75
45	32.60	12.83
50	32.84	12.93
55	32.97	12.98
60	33.15	13.05
65	33.33	13.12
70	33.47	13.18
75	33.70	13.27
80	33.98	13.38
85	34.29	13.50
90	34.63	13.63
95	35.18	13.85
97	35.56	14.00
98	35.81	14.10
99	36.32	14.30
max	37.08	14.60



Mean: 32.939 (0.099) cm; 12.968 (0.039) in  
Standard deviation: 1.399 (0.070) cm; 0.551 (0.027) in  
Coefficient of variation: 4.249 (0.212) %  
Range: 29.21–37.08 cm; 11.50–14.60 in  
No. of subjects: 200

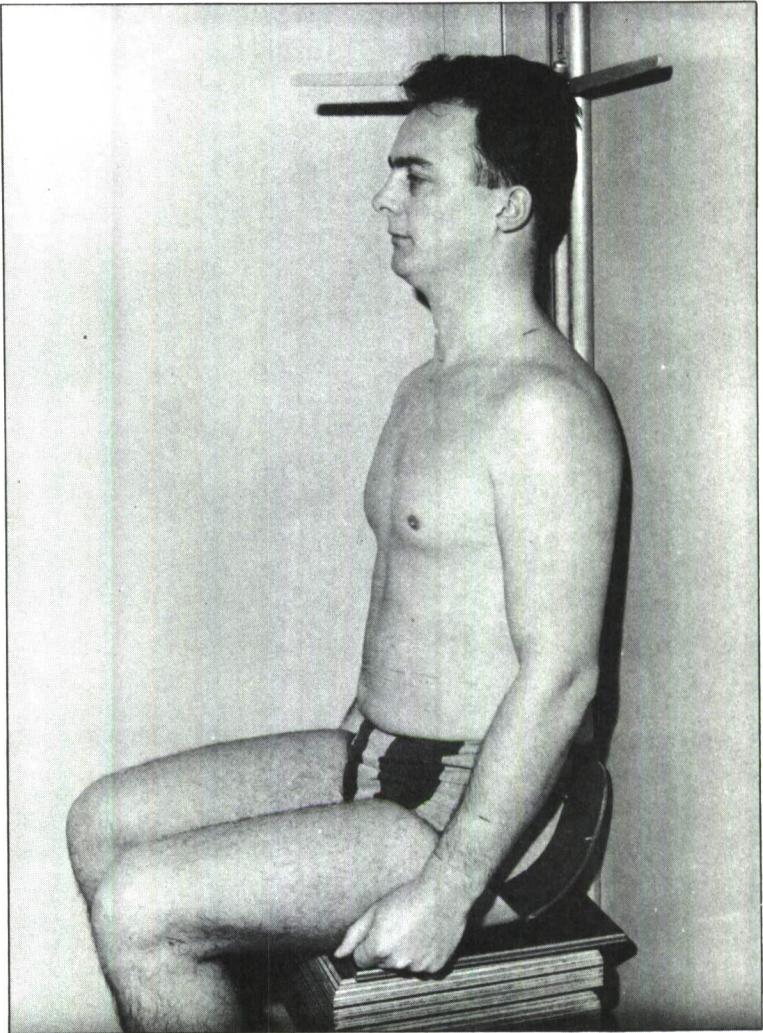
Table 17  
HEEL/INSTEP GIRTH



Subject seated, upper surface of thighs horizontal, lower the upper arm of the measuring head until the datum edge makes light contact with the subjects head. Record height of datum edge above floor datum. Deduct from this measurement the height of the stool, similarly measured, to give subject sitting height.

PERCENTILE VALUES

%	cm	in
min	85.85	33.80
1	86.11	33.90
2	86.87	34.20
3	87.25	34.35
5	87.63	34.50
10	88.26	34.75
15	89.07	35.07
20	89.92	35.40
25	90.42	35.60
30	91.00	35.82
35	91.47	36.01
40	91.76	36.13
45	92.01	36.23
50	92.33	36.35
55	92.74	36.51
60	93.09	36.65
65	93.60	36.85
70	94.04	37.02
75	94.91	37.37
80	95.31	37.52
85	96.01	37.80
90	96.77	38.10
95	97.66	38.45
97	98.17	38.65
98	98.55	38.80
99	98.81	38.90
max	100.33	39.50



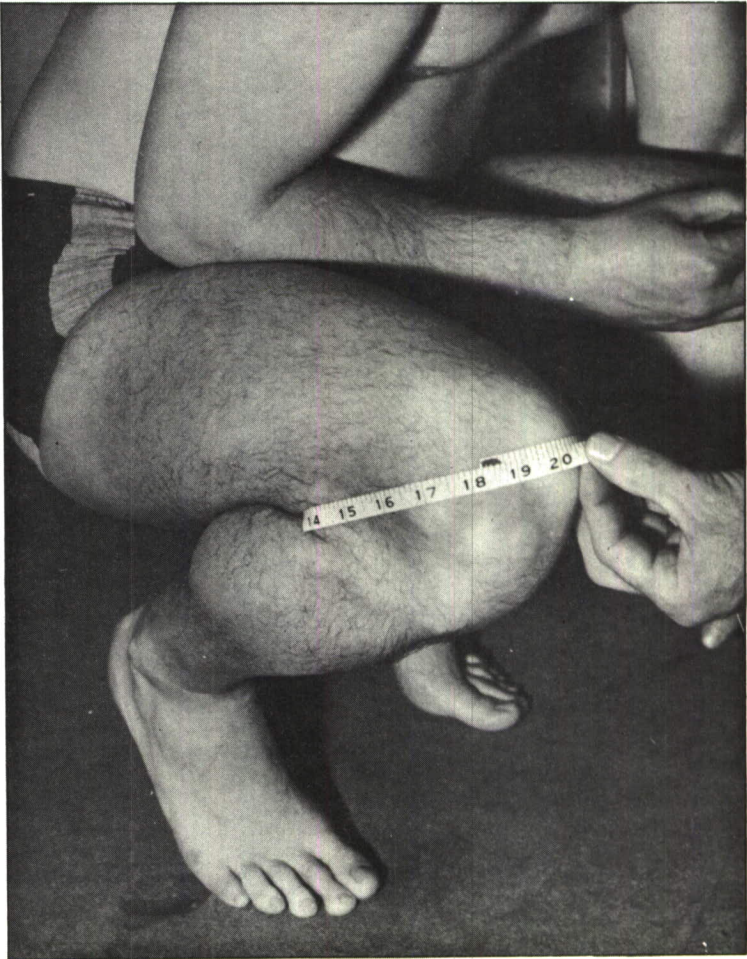
Mean: 92.662 (0.215) cm; 36.481 (0.085) in  
Standard deviation: 3.043 (0.152) cm; 1.198 (0.060) in  
Coefficient of variation: 3.284 (0.164) %  
Range: 85.85–100.33 cm; 33.80–39.50 in  
No. of subjects: 200

Table 18  
SITTING HEIGHT

With subject standing, place the tape in the crease behind the knee. Subject then fully flexes the knee and the measure is taken round the maximum knee prominence.

PERCENTILE VALUES

%	cm	in
min	38.10	15.00
1	38.61	15.20
2	39.12	15.40
3	39.50	15.55
5	39.88	15.70
10	40.41	15.91
15	40.64	16.00
20	40.99	16.14
25	41.33	16.27
30	41.73	16.43
35	42.04	16.55
40	42.39	16.69
45	42.73	16.82
50	42.93	16.90
55	43.14	16.98
60	43.36	17.07
65	43.61	17.17
70	44.04	17.34
75	44.58	17.55
80	45.08	17.75
85	45.43	17.89
90	45.80	18.03
95	46.79	18.42
97	46.99	18.50
98	47.37	18.65
99	48.26	19.00
max	49.53	19.50



Mean: 43.142 (0.152) cm; 16.985 (0.060) in  
Standard deviation: 2.151 (0.108) cm; 0.847 (0.042) in  
Coefficient of variation: 4.987 (0.249) %  
Range: 38.10–49.53 cm; 15.00–19.50 in  
No. of subjects: 200

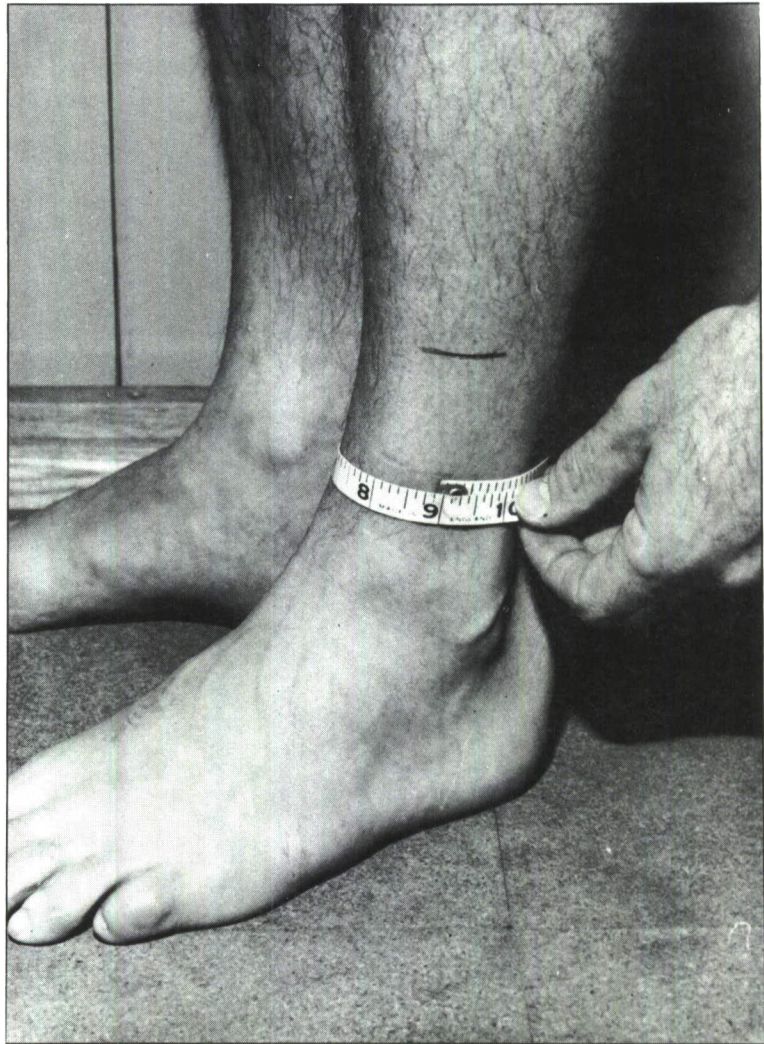
Table 19  
KNEE GIRTH – FULLY FLEXED



Tape at the smallest circumference immediately above the ankle bones.

PERCENTILE VALUES

%	cm	in
min	19.56	7.70
1	19.81	7.80
2	20.07	7.90
3	20.32	8.00
5	20.42	8.04
10	20.70	8.15
15	21.19	8.34
20	21.40	8.42
25	21.50	8.46
30	21.61	8.51
35	21.84	8.60
40	22.00	8.66
45	22.18	8.73
50	22.40	8.82
55	22.63	8.91
60	22.86	9.00
65	22.99	9.05
70	23.11	9.10
75	23.39	9.21
80	23.57	9.28
85	23.78	9.36
90	24.03	9.46
95	24.32	9.58
97	24.64	9.70
98	24.89	9.80
99	25.15	9.90
max	26.67	10.50



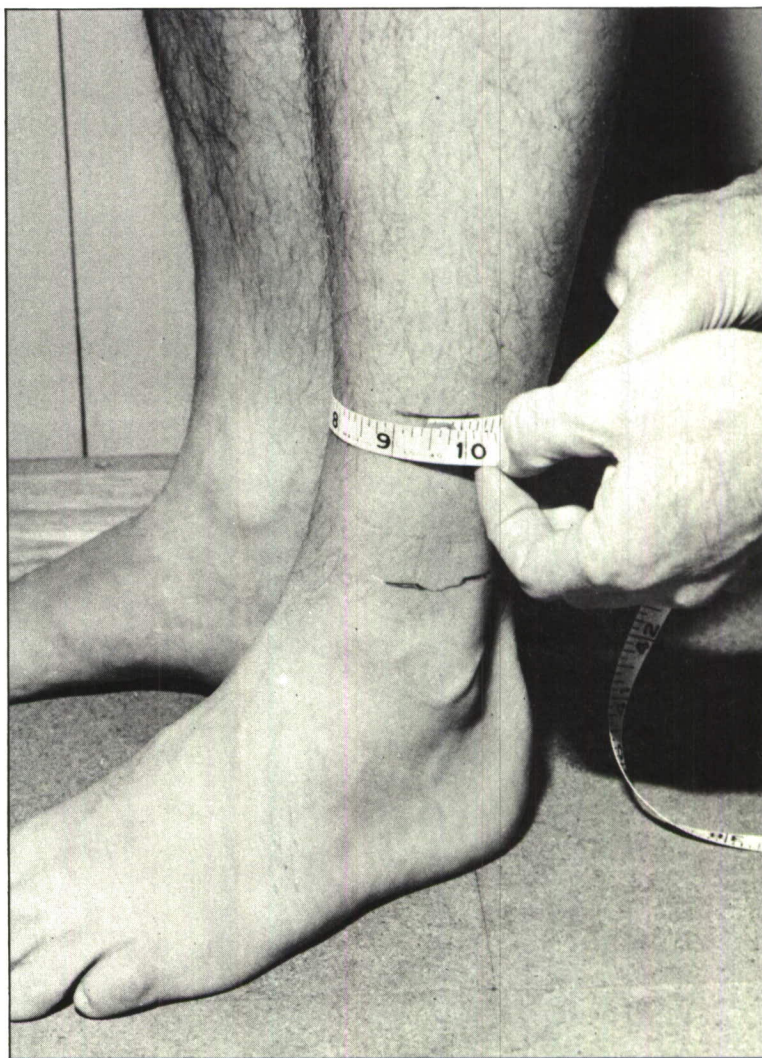
Mean: 22.563 (0.089) cm; 8.883 (0.035) in  
 Standard deviation: 1.257 (0.063) cm; 0.495 (0.025) in  
 Coefficient of variation: 5.572 (0.279) %  
 Range: 19.56–26.67 cm; 7.70–10.50 in  
 No. of subjects: 200

Table 20  
 ANKLE GIRTH – MINIMUM

Mark datum plane  $2\frac{1}{2}$  inches above minimum ankle girth (Table 20 refers). Measure and record girth at this plane.

# PERCENTILE VALUES

%	cm	in
min	20.32	8.00
1	21.08	8.30
2	21.42	8.43
3	21.59	8.50
5	21.79	8.58
10	22.39	8.81
15	22.75	8.96
20	22.98	9.05
25	23.24	9.15
30	23.59	9.29
35	23.83	9.38
40	24.01	9.45
45	24.18	9.52
50	24.34	9.58
55	24.66	9.71
60	24.91	9.81
65	25.09	9.88
70	25.27	9.95
75	25.59	10.07
80	25.83	10.17
85	26.10	10.27
90	26.35	10.37
95	26.88	10.58
97	27.18	10.70
98	27.60	10.87
99	27.94	11.00
max	28.45	11.20



Mean: 24.546 (0.110) cm; 9.664 (0.043) in  
 Standard deviation: 1.557 (0.078) cm; 0.613 (0.031) in  
 Coefficient of variation: 6.343 (0.317) %  
 Range: 20.32–28.45 cm; 8.00–11.20 in  
 No. of subjects: 200

Table 21  
 ANKLE GIRTH –  $2\frac{1}{2}$  INCHES ABOVE MINIMUM ANKLE GIRTH



Tape in a horizontal plane around maximum girth of calf.

PERCENTILE VALUES

%	cm	in
min	31.50	12.40
1	31.75	12.50
2	32.00	12.60
3	32.26	12.70
5	32.83	12.92
10	33.63	13.24
15	34.15	13.44
20	34.43	13.56
25	34.85	13.72
30	35.22	13.87
35	35.59	14.01
40	35.88	14.12
45	36.19	14.25
50	36.49	14.37
55	36.71	14.45
60	36.98	14.56
65	37.28	14.68
70	37.63	14.82
75	37.99	14.96
80	38.35	15.10
85	39.05	15.37
90	39.54	15.57
95	40.51	15.95
97	40.98	16.13
98	41.15	16.20
99	41.74	16.43
max	41.91	16.50



Mean: 36.632 (0.161) cm; 14.422 (0.063) in  
 Standard deviation: 2.273 (0.114) cm; 0.895 (0.045) in  
 Coefficient of variation: 6.206 (0.310) %  
 Range: 31.50–41.91 cm; 12.40–16.50 in  
 No. of subjects: 200

Table 22  
 CALF GIRTH

Tape in a horizontal plane located around the minimum girth between calf and knee.

# PERCENTILE VALUES

%	cm	in
min	29.97	11.80
1	30.10	11.85
2	30.35	11.95
3	30.52	12.01
5	30.66	12.07
10	31.17	12.27
15	31.50	12.40
20	31.83	12.53
25	32.03	12.61
30	32.30	12.72
35	32.64	12.85
40	32.95	12.97
45	33.37	13.14
50	33.58	13.22
55	33.88	13.34
60	34.13	13.44
65	34.31	13.51
70	34.52	13.59
75	34.86	13.72
80	35.31	13.90
85	35.86	14.12
90	36.39	14.32
95	37.03	14.58
97	37.24	14.66
98	37.34	14.70
99	38.10	15.00
max	38.86	15.30



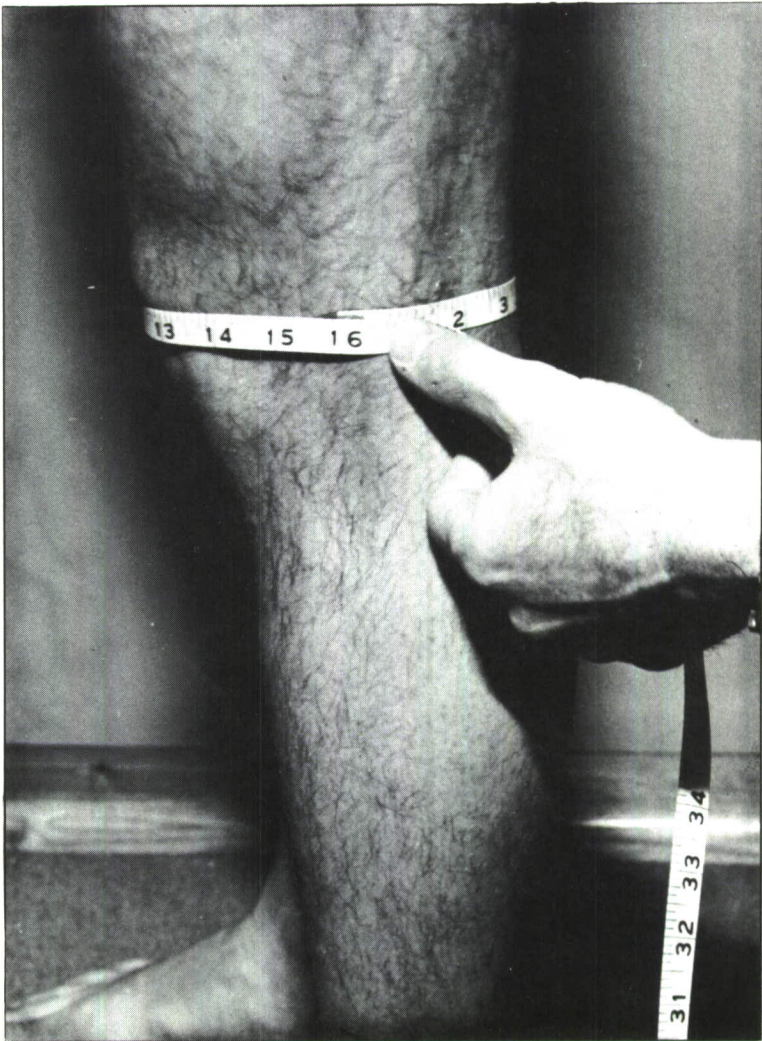
Mean: 33.754 (0.137) cm; 13.289 (0.054) in  
 Standard deviation: 1.930 (0.097) cm; 0.760 (0.038) in  
 Coefficient of variation: 5.719 (0.286) %  
 Range: 29.97–38.86 cm; 11.80–15.30 in  
 No. of subjects: 200

Table 23  
 SMALL GIRTH (GARTER)



Tape in a horizontal plane around maximum knee circumference.

PERCENTILE VALUES		
%	cm	in
min	33.78	13.30
1	34.16	13.45
2	34.80	13.70
3	35.31	13.90
5	35.42	13.94
10	35.81	14.10
15	36.45	14.35
20	36.80	14.49
25	37.16	14.63
30	37.41	14.73
35	37.70	14.84
40	37.95	14.94
45	38.12	15.01
50	38.33	15.09
55	38.71	15.24
60	39.16	15.42
65	39.29	15.47
70	39.50	15.55
75	39.88	15.70
80	40.28	15.86
85	40.58	15.97
90	41.15	16.20
95	42.02	16.54
97	42.16	16.60
98	42.93	16.90
99	43.56	17.15
max	45.97	18.10



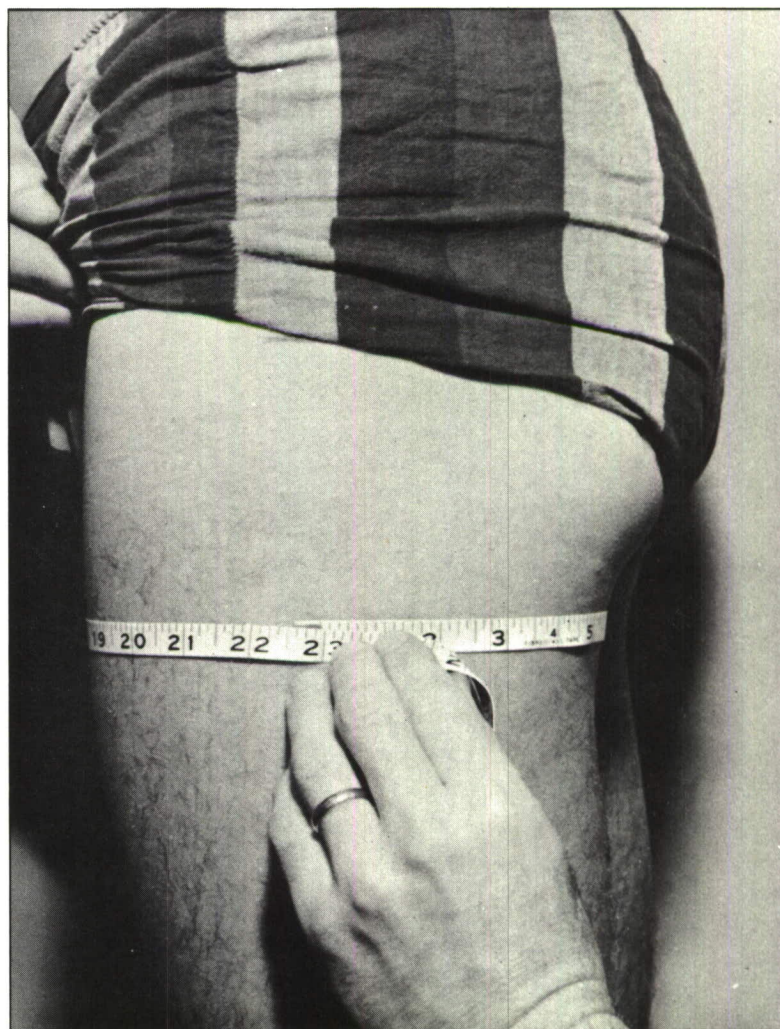
Mean: 38.669 (0.144) cm; 15.224 (0.057) in  
Standard deviation: 2.037 (0.102) cm; 0.802 (0.040) in  
Coefficient of variation: 5.269 (0.263) %  
Range: 33.78–45.97 cm; 13.30–18.10 in  
No. of subjects: 200

Table 24  
KNEE GIRTH – STANDING

Tape horizontal around the maximum thigh girth, close up to crotch and immediately below the gluteal furrow.

# PERCENTILE VALUES

%	cm	in
min	46.23	18.20
1	48.01	18.90
2	48.51	19.10
3	49.40	19.45
5	50.16	19.75
10	51.10	20.12
15	51.87	20.42
20	52.68	20.74
25	53.21	20.95
30	53.72	21.15
35	54.28	21.37
40	54.86	21.60
45	55.31	21.78
50	55.85	21.99
55	56.56	22.27
60	57.35	22.58
65	57.91	22.80
70	58.27	22.94
75	58.80	23.15
80	59.86	23.57
85	60.50	23.82
90	61.34	24.15
95	62.74	24.70
97	63.88	25.15
98	64.26	25.30
99	66.04	26.00
max	69.09	27.20



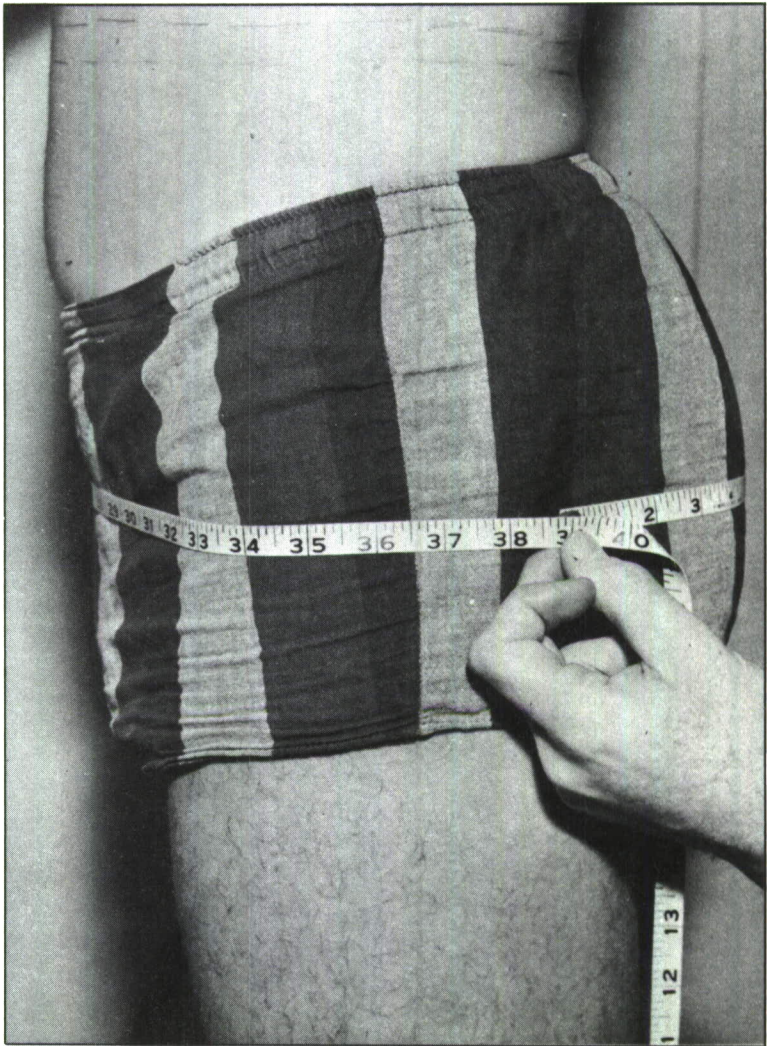
Mean: 56.314 (0.285) cm; 22.171 (0.112) in  
 Standard deviation: 4.031 (0.202) cm; 1.587 (0.079) in  
 Coefficient of variation: 7.159 (0.358) %  
 Range: 46.23–69.09 cm; 18.20–27.20 in  
 No. of subjects: 200

Table 25  
THIGH GIRTH



Tape horizontal around the maximum buttock circumference.

PERCENTILE VALUES		
%	cm	in
min	87.12	34.30
1	87.12	34.30
2	89.58	35.27
3	89.92	35.40
5	90.93	35.80
10	91.95	36.20
15	92.71	36.50
20	93.88	36.96
25	94.74	37.30
30	95.18	37.47
35	96.01	37.80
40	96.90	38.15
45	97.62	38.43
50	98.40	38.74
55	98.95	38.96
60	99.63	39.22
65	100.33	39.50
70	101.40	39.92
75	102.11	40.20
80	103.25	40.65
85	104.22	41.03
90	105.41	41.50
95	106.85	42.07
97	107.95	42.50
98	108.46	42.70
99	109.73	43.20
max	117.35	46.20



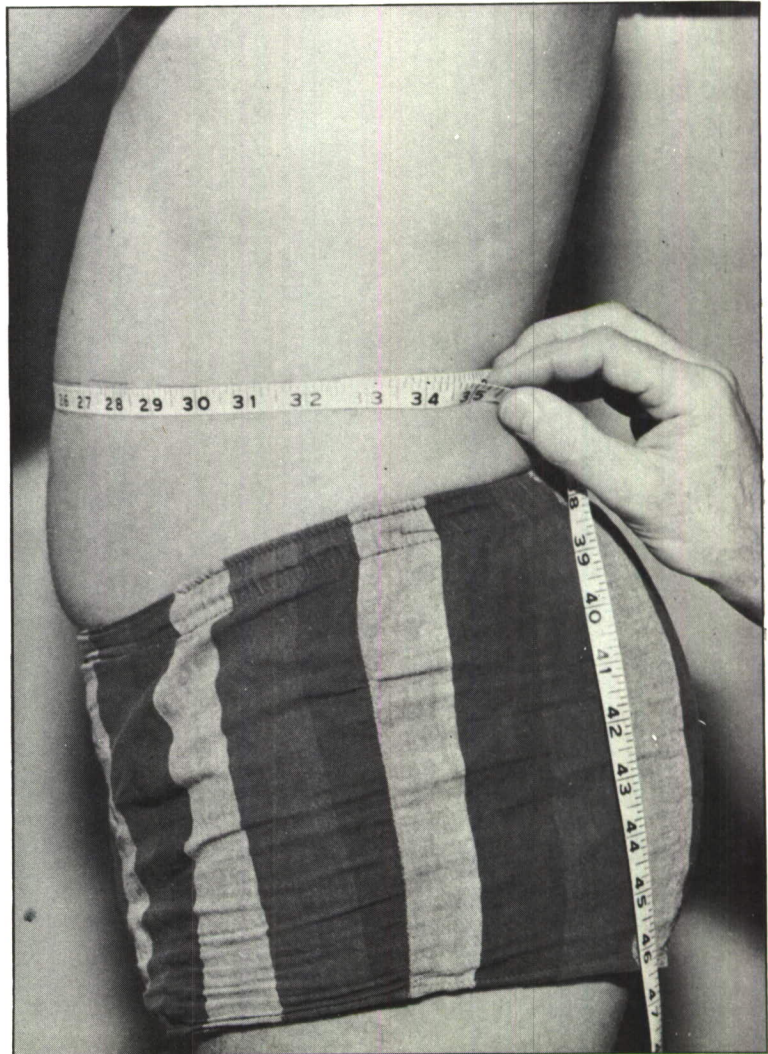
Mean: 98.674 (0.364) cm; 38.848 (0.143) in  
Standard deviation: 5.154 (0.257) cm; 2.029 (0.101) in  
Coefficient of variation: 5.223 (0.261) %  
Range: 87.12–117.35 cm; 34.30–46.20 in  
No. of subjects: 200

Table 26  
BUTTOCK GIRTH

Tape horizontal around natural waist, previously located and marked with aid of adjustable belt.

# PERCENTILE VALUES

%	cm	in
min	68.58	27.00
1	71.12	28.00
2	72.64	28.60
3	72.81	28.67
5	74.17	29.20
10	75.27	29.63
15	76.45	30.10
20	77.47	30.50
25	78.49	30.90
30	79.18	31.18
35	80.19	31.57
40	81.10	31.93
45	81.60	32.13
50	82.63	32.53
55	83.57	32.90
60	84.92	33.43
65	85.85	33.80
70	87.04	34.27
75	88.39	34.80
80	89.15	35.10
85	90.30	35.55
90	92.20	36.30
95	96.27	37.90
97	98.55	38.80
98	100.33	39.50
99	101.09	39.80
max	105.41	41.50



Mean: 83.705 (0.486) cm; 32.955 (0.191) in  
 Standard deviation: 6.876 (0.343) cm; 2.707 (0.135) in  
 Coefficient of variation: 8.214 (0.411) %  
 Range: 68.58–105.41 cm; 27.00–41.50 in  
 No. of subjects: 200

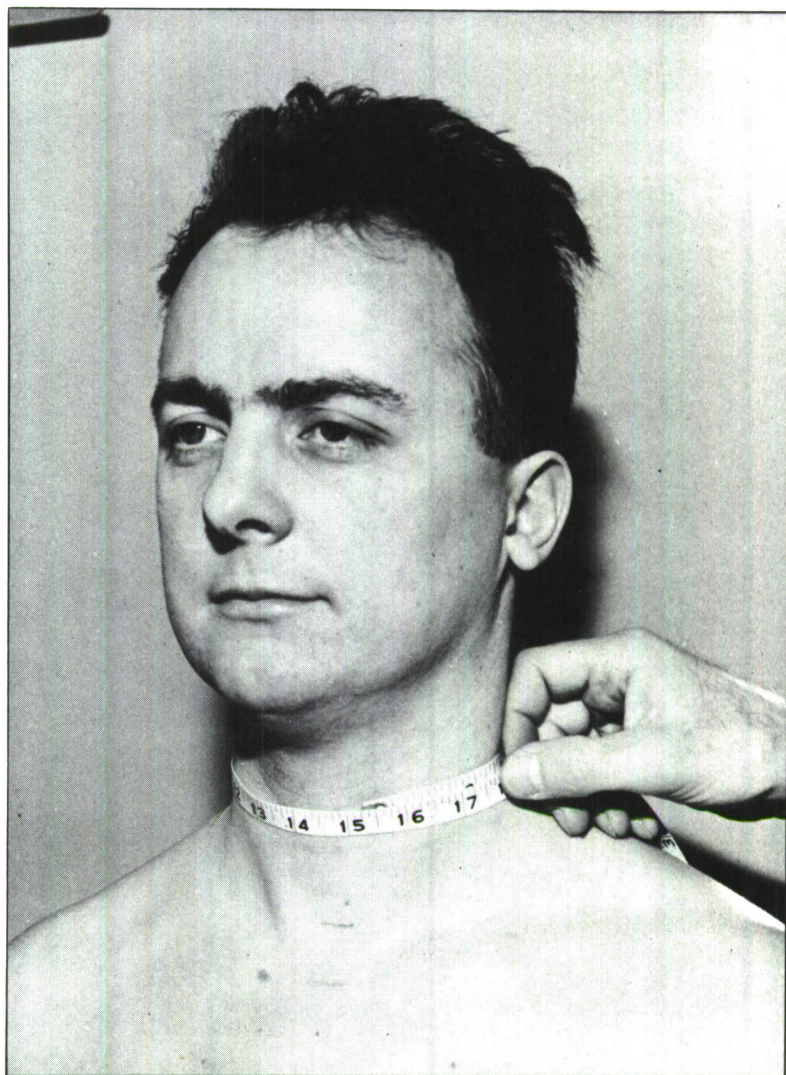
Table 27  
 WAIST GIRTH



Measuring tape around neck at position of normal collar band.

PERCENTILE VALUES

%	cm	in
min	33.27	13.10
1	34.29	13.50
2	34.54	13.60
3	35.22	13.87
5	35.63	14.03
10	35.97	14.16
15	36.34	14.31
20	36.55	14.39
25	36.80	14.49
30	37.02	14.57
35	37.20	14.64
40	37.39	14.72
45	37.76	14.87
50	37.99	14.96
55	38.19	15.04
60	38.37	15.11
65	38.53	15.17
70	38.91	15.32
75	39.29	15.47
80	39.53	15.56
85	39.91	15.71
90	40.26	15.85
95	40.98	16.13
97	41.66	16.40
98	42.04	16.55
99	42.67	16.80
max	43.94	17.30



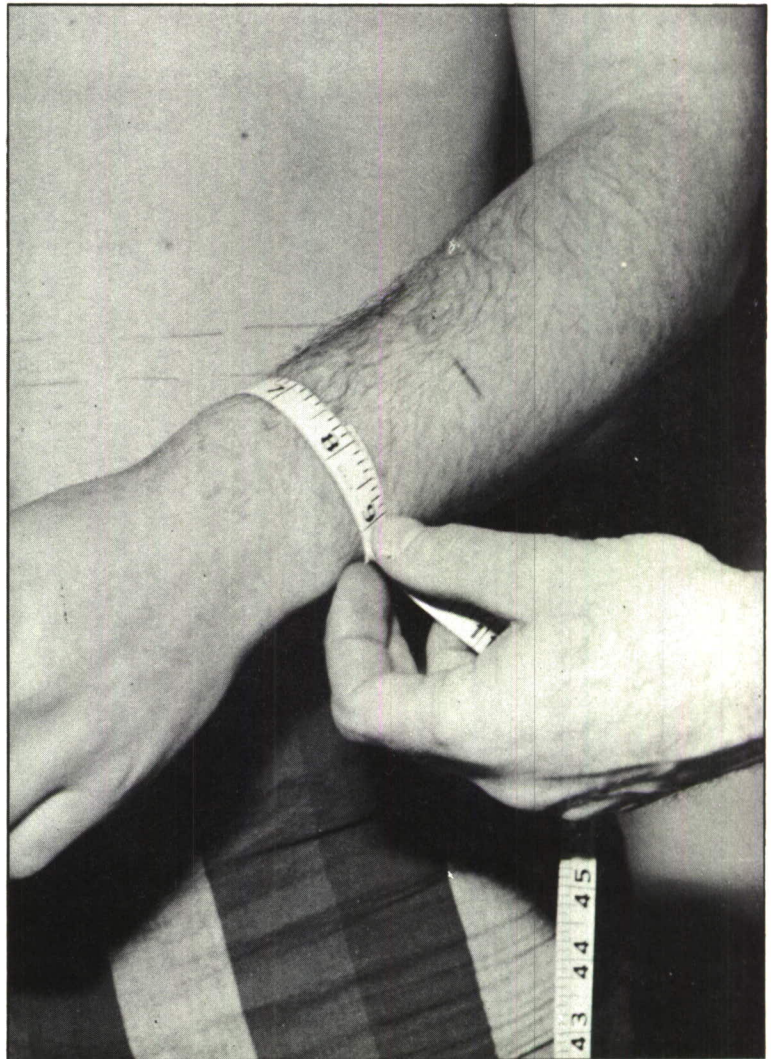
Mean: 38.186 (0.124) cm; 15.034 (0.049) in  
 Standard deviation: 1.750 (0.088) cm; 0.689 (0.034) in  
 Coefficient of variation: 4.583 (0.229) %  
 Range: 33.27–43.94 cm; 13.10–17.30 in  
 No. of subjects: 200

Table 28  
NECK GIRTH

Measure minimum wrist girth immediately above styloid process.

# PERCENTILE VALUES

%	cm	in
min	15.49	6.10
1	15.49	6.10
2	16.00	6.30
3	16.05	6.32
5	16.15	6.36
10	16.35	6.44
15	16.50	6.49
20	16.64	6.55
25	16.78	6.61
30	16.94	6.67
35	17.07	6.72
40	17.18	6.77
45	17.30	6.81
50	17.43	6.86
55	17.56	6.91
60	17.66	6.95
65	17.76	6.99
70	17.89	7.04
75	18.02	7.09
80	18.21	7.17
85	18.48	7.27
90	18.73	7.37
95	19.13	7.53
97	19.61	7.72
98	19.71	7.76
99	19.81	7.80
max	20.57	8.10



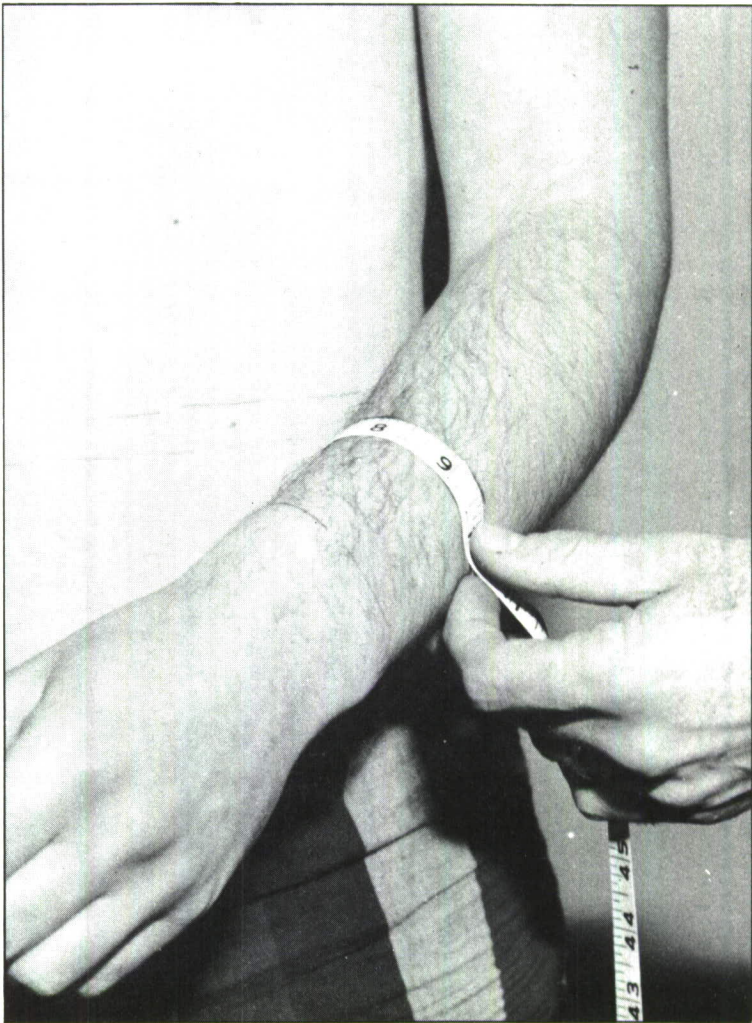
Mean: 17.610 (0.066) cm; 6.933 (0.026) in  
 Standard deviation: 0.927 (0.046) cm; 0.365 (0.018) in  
 Coefficient of variation: 5.265 (0.263) %  
 Range: 15.49–20.57 cm; 6.10–8.10 in  
 No. of subjects: 200

Table 29  
 WRIST GIRTH – MINIMUM ABOVE STYLOID PROCESS



With the minimum wrist girth located (Table 29) by the distal edge of a narrow wrist band, locate and mark a plane 2½ inches up the forearm from this edge. Measure the girth at this plane.

PERCENTILE VALUES		
%	cm	in
min	17.02	6.70
1	17.27	6.80
2	17.65	6.95
3	17.91	7.05
5	18.22	7.17
10	18.50	7.28
15	18.85	7.42
20	19.11	7.53
25	19.39	7.63
30	19.59	7.71
35	19.75	7.78
40	19.92	7.84
45	20.09	7.91
50	20.23	7.96
55	20.38	8.03
60	20.59	8.11
65	20.74	8.16
70	20.93	8.24
75	21.16	8.33
80	21.35	8.41
85	21.54	8.48
90	21.84	8.60
95	22.22	8.75
97	22.61	8.90
98	22.99	9.05
99	23.24	9.15
max	23.88	9.40



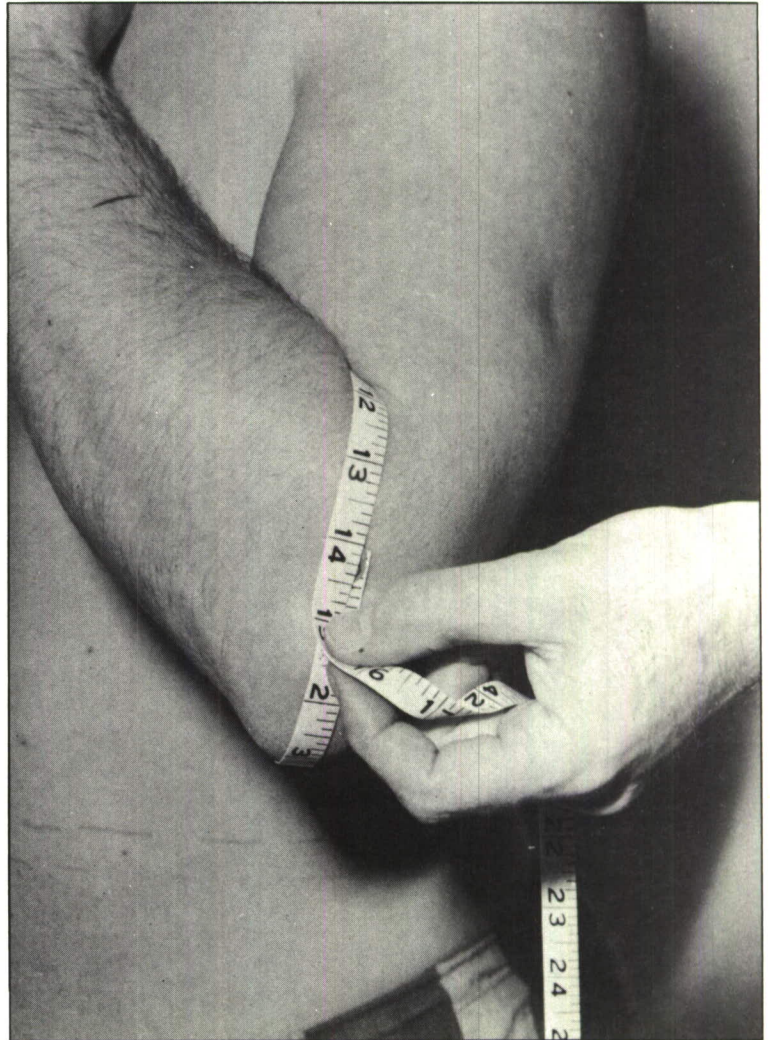
Mean: 20.366 (0.089) cm; 8.018 (0.035) in  
Standard deviation: 1.262 (0.063) cm; 0.497 (0.025) in  
Coefficient of variation: 6.199 (0.310) %  
Range: 17.02–23.88 cm; 6.70–9.40 in  
No. of subjects: 200

Table 30  
WRIST GIRTH – 2½ INCHES ABOVE MINIMUM WRIST GIRTH

Position the measuring tape through the inside face of the elbow joint with the joint flexed at 90°, then fully flex the joint and measure the girth with the tape passing over the maximum elbow prominence.

# PERCENTILE VALUES

%	cm	in
min	30.48	12.00
1	30.73	12.10
2	31.31	12.32
3	31.43	12.38
5	32.00	12.60
10	32.84	12.93
15	33.32	13.12
20	33.65	13.25
25	33.90	13.35
30	34.12	13.43
35	34.33	13.51
40	34.51	13.59
45	34.73	13.67
50	34.92	13.75
55	35.15	13.84
60	35.49	13.97
65	35.81	14.10
70	36.04	14.19
75	36.32	14.30
80	36.66	14.43
85	36.95	14.55
90	37.27	14.67
95	37.91	14.92
97	38.23	15.05
98	38.61	15.20
99	38.86	15.30
max	40.13	15.80



Mean: 35.171 (0.125) cm; 13.847 (0.049) in  
 Standard deviation: 1.768 (0.088) cm; 0.696 (0.035) in  
 Coefficient of variation: 5.026 (0.251) %  
 Range: 30.48–40.13 cm; 12.00–15.80 in  
 No. of subjects: 200

Table 31  
 ELBOW GIRTH – FULLY FLEXED



Locate the measuring tape around the maximum biceps girth.

PERCENTILE VALUES

%	cm	in
min	23.62	9.30
1	23.88	9.40
2	25.15	9.90
3	25.32	9.97
5	25.53	10.05
10	26.08	10.27
15	26.50	10.43
20	26.84	10.57
25	27.30	10.75
30	27.59	10.86
35	27.90	10.99
40	28.15	11.08
45	28.45	11.20
50	28.83	11.35
55	29.17	11.49
60	29.68	11.68
65	29.91	11.78
70	30.19	11.89
75	30.54	12.02
80	31.01	12.21
85	31.33	12.33
90	32.13	12.65
95	33.34	13.12
97	33.78	13.30
98	34.04	13.40
99	34.54	13.60
max	35.56	14.00



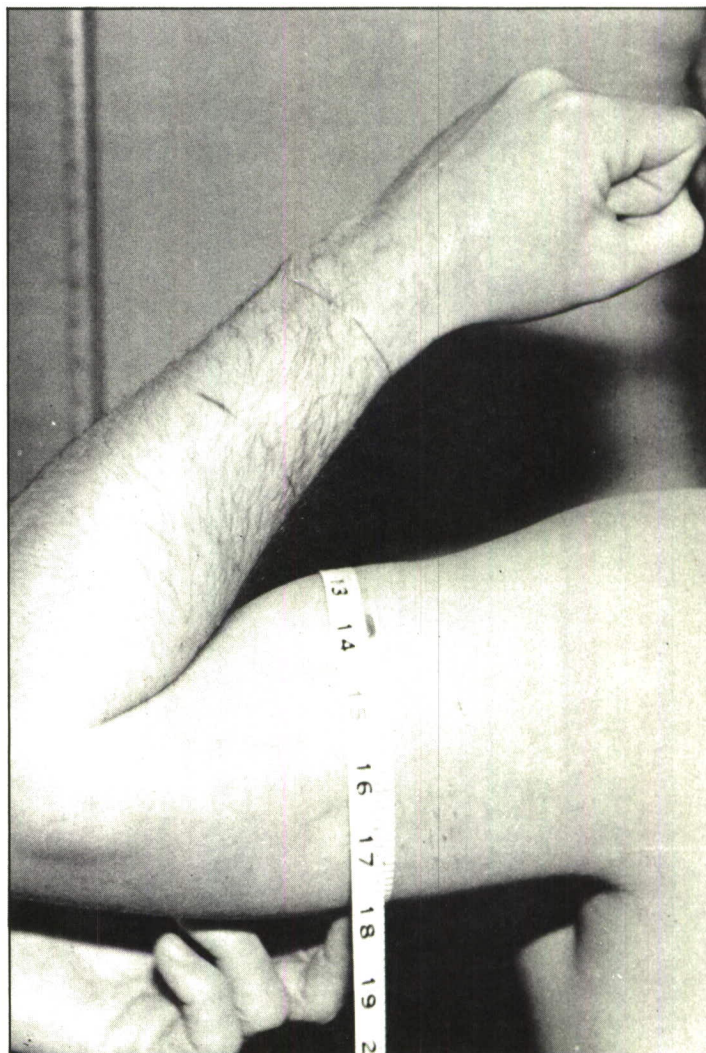
Mean: 29.129 (0.166) cm; 11.468 (0.065) in  
Standard deviation: 2.342 (0.117) cm; 0.922 (0.046) in  
Coefficient of variation: 8.040 (0.402) %  
Range: 23.62–35.56 cm; 9.30–14.00 in  
No. of subjects: 200

Table 32  
BICEPS GIRTH – EXTENDED

Subject bends arm and clenches fist to produce maximum biceps girth. Measuring tape records maximum girth.

# PERCENTILE VALUES

%	cm	in
min	25.15	9.90
1	26.92	10.60
2	27.43	10.80
3	28.26	11.12
5	28.57	11.25
10	29.03	11.43
15	29.39	11.57
20	29.72	11.70
25	30.26	11.91
30	30.63	12.06
35	30.90	12.17
40	31.28	12.32
45	31.68	12.47
50	32.00	12.60
55	32.41	12.76
60	32.62	12.84
65	32.83	12.92
70	33.07	13.02
75	33.53	13.20
80	33.99	13.38
85	34.54	13.60
90	36.07	14.20
95	36.58	14.40
97	37.85	14.90
98	38.10	15.00
99	38.27	15.07
max	39.62	15.60



Mean: 32.228 (0.180) cm; 12.688 (0.072) in  
 Standard deviation: 2.545 (0.127) cm; 1.002 (0.050) in  
 Coefficient of variation: 7.897 (0.395) %  
 Range: 25.15–39.62 cm; 9.90–15.60 in  
 No. of subjects: 200

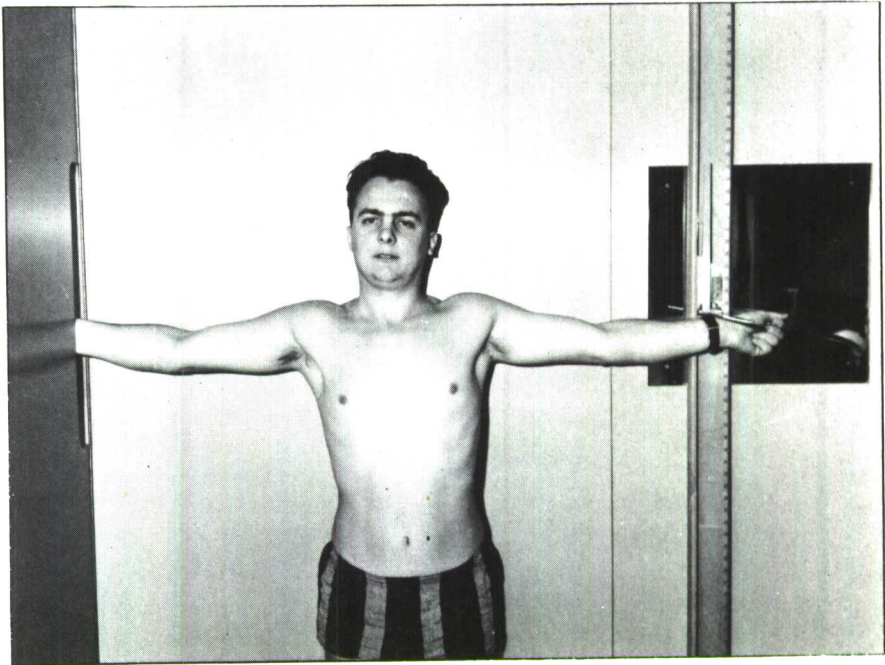
Table 33  
 BICEPS GIRTH – CONTRACTED



With the arms outstretched horizontally and right hand passed through slot in rig wall, align right wrist datum mark with wall datum face. The datum edge of the upper arm of the measuring head is then aligned with the left wrist datum mark and the wrist span recorded on the horizontal scale.

PERCENTILE VALUES

%	cm	in
min	121.92	48.00
1	123.19	48.50
2	124.21	48.90
3	125.48	49.40
5	127.25	50.10
10	128.78	50.70
15	130.30	51.30
20	131.44	51.75
25	132.84	52.30
30	133.52	52.57
35	134.29	52.87
40	134.87	53.10
45	135.38	53.30
50	135.85	53.49
55	136.74	53.83
60	137.75	54.23
65	138.94	54.70
70	139.65	54.98
75	140.89	55.47
80	141.54	55.73
85	142.24	56.00
90	143.76	56.60
95	145.03	57.10
97	147.32	58.00
98	147.57	58.10
99	150.75	59.35
max	153.42	60.40



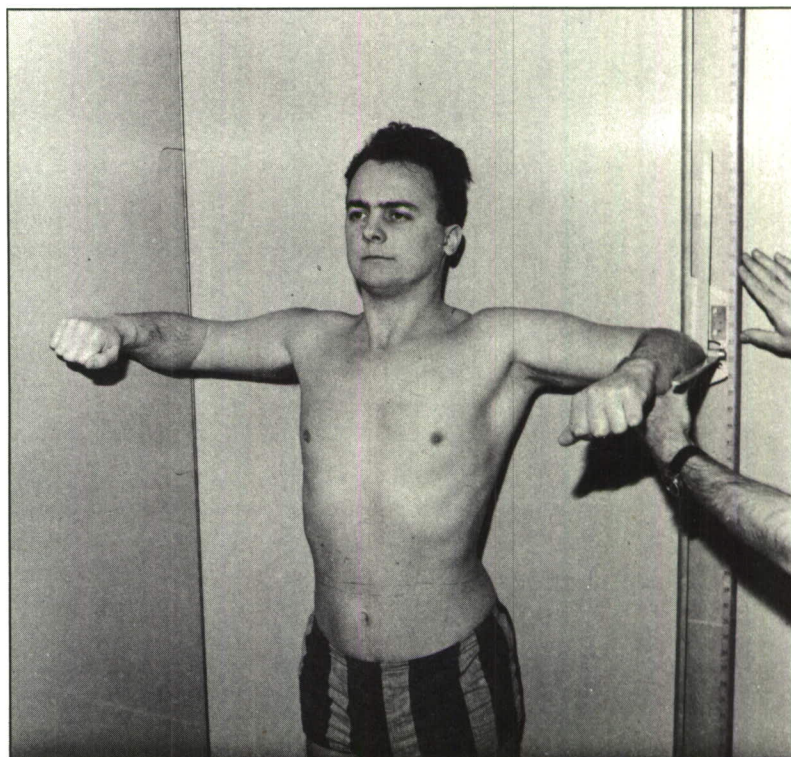
Mean: 136.553 (0.408) cm; 53.761 (0.161) in  
Standard deviation: 5.776 (0.289) cm; 2.274 (0.114) in  
Coefficient of variation: 4.230 (0.211) %  
Range: 121.92–153.42 cm; 48.00–60.40 in  
No. of subjects: 200

Table 34  
INTER-WRIST SPAN

Subject stands with the upper arms outstretched horizontally to the side and the forearms in a horizontal plane at 90° to the upper arms. Contact datum wall with right elbow and position datum edge of measuring head arm against left elbow. Record distance across elbow prominences on horizontal scale

## PERCENTILE VALUES

%	cm	in
min	87.88	34.60
1	88.90	35.00
2	89.53	35.25
3	89.92	35.40
5	91.02	35.83
10	92.33	36.35
15	93.17	36.68
20	93.85	36.95
25	94.49	37.20
30	95.38	37.55
35	95.76	37.70
40	96.27	37.90
45	96.90	38.15
50	97.38	38.34
55	97.79	38.50
60	98.55	38.80
65	99.06	39.00
70	99.85	39.31
75	100.23	39.46
80	100.95	39.74
85	101.47	39.95
90	102.36	40.30
95	104.14	41.00
97	105.24	41.43
98	105.66	41.60
99	106.93	42.10
max	108.71	42.80



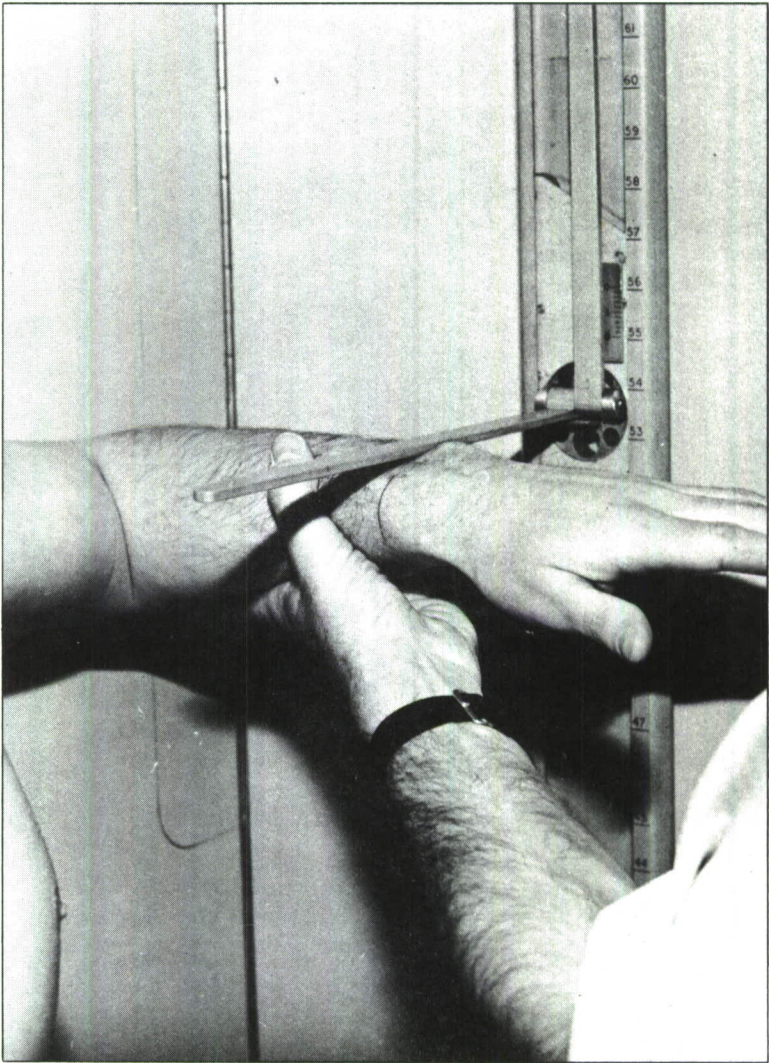
Mean: 97.577 (0.285) cm; 38.416 (0.113) in  
 Standard deviation: 4.046 (0.202) cm; 1.593 (0.080) in  
 Coefficient of variation: 4.147 (0.207) %  
 Range: 87.88–108.71 cm; 34.60–42.80 in  
 No. of subjects: 200

Table 35  
INTER-ELBOW SPAN



With back of elbow against datum wall of rig, set datum edge of upper arm of measuring head in line with wrist datum mark. Record distance from wall to datum edge on horizontal scale.

PERCENTILE VALUES		
%	cm	in
min	22.61	8.90
1	23.11	9.10
2	23.37	9.20
3	23.49	9.25
5	23.72	9.34
10	24.28	9.56
15	24.53	9.66
20	24.78	9.76
25	25.02	9.85
30	25.22	9.93
35	25.41	10.01
40	25.56	10.06
45	25.69	10.12
50	25.82	10.16
55	25.95	10.22
60	26.08	10.27
65	26.25	10.34
70	26.48	10.43
75	26.70	10.51
80	26.94	10.60
85	27.06	10.65
90	27.22	10.72
95	27.94	11.00
97	28.45	11.20
98	28.70	11.30
99	29.21	11.50
max	30.48	12.00



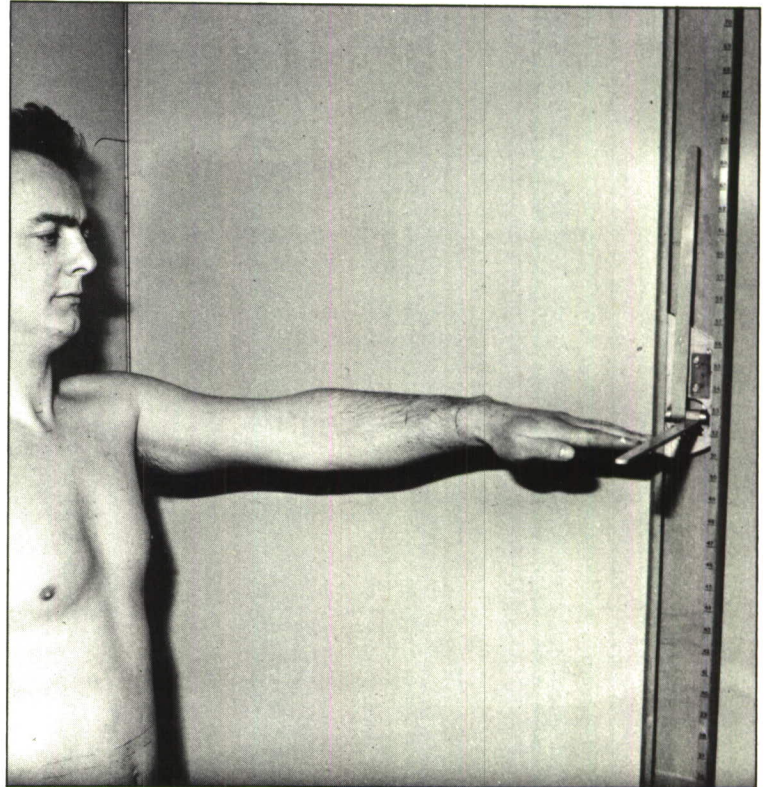
Mean: 25.966 (0.089) cm; 10.223 (0.035) in  
Standard deviation: 1.260 (0.063) cm; 0.496 (0.025) in  
Coefficient of variation: 4.852 (0.243) %  
Range: 22.61–30.48 cm; 8.90–12.00 in  
No. of subjects: 200

Table 36  
ELBOW TO WRIST LENGTH

Subject stands with shoulders against datum wall and left arm and hand extended horizontally. Locate datum edge of measuring head against tip of longest finger and record dimension from horizontal scale.

# PERCENTILE VALUES

%	cm	in
min	75.18	29.60
1	75.61	29.77
2	76.45	30.10
3	77.22	30.40
5	77.85	30.65
10	79.67	31.37
15	80.39	31.65
20	81.28	32.00
25	81.99	32.28
30	82.80	32.60
35	83.31	32.80
40	83.95	33.05
45	84.44	33.24
50	84.87	33.41
55	85.29	33.58
60	85.55	33.68
65	85.90	33.82
70	86.55	34.07
75	87.25	34.35
80	87.82	34.57
85	88.98	35.03
90	89.92	35.40
95	90.93	35.80
97	91.69	36.10
98	92.71	36.50
99	93.98	37.00
max	100.84	39.70



Mean: 84.889 (0.291) cm; 33.421 (0.114) in  
 Standard deviation: 4.100 (0.205) cm; 1.614 (0.081) in  
 Coefficient of variation: 4.829 (0.241) %  
 Range: 75.18–100.84 cm; 29.60–39.70 in  
 No. of subjects: 200

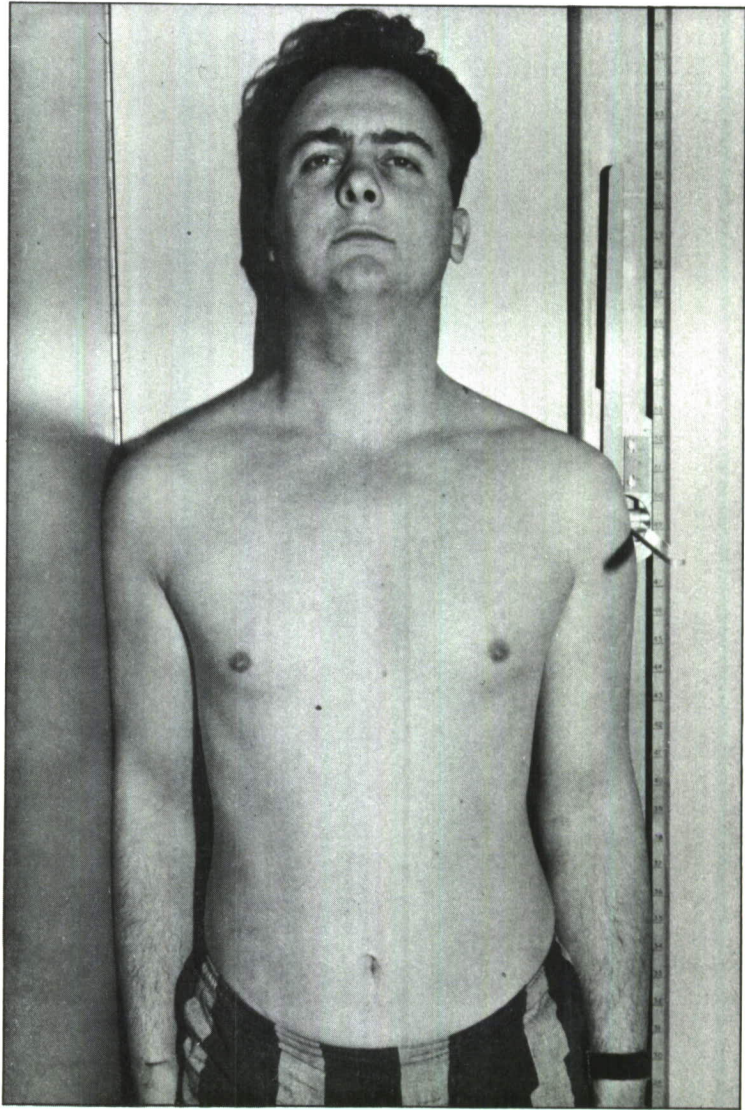
Table 37  
 ARM REACH – FROM WALL



Subject stands with right shoulder against datum wall. Position the datum edge of measuring head at the maximum protrusion of the deltoid muscle and record shoulder breadth from the horizontal rig scale.

PERCENTILE VALUES

%	cm	in
min	39.62	15.60
1	39.88	15.70
2	40.51	15.95
3	40.89	16.10
5	41.40	16.30
10	42.25	16.63
15	42.76	16.83
20	43.14	16.99
25	43.52	17.13
30	43.77	17.23
35	44.01	17.32
40	44.29	17.44
45	44.53	17.53
50	44.82	17.64
55	45.14	17.77
60	45.57	17.94
65	45.92	18.08
70	46.20	18.19
75	46.42	18.28
80	46.82	18.43
85	47.28	18.61
90	47.69	18.78
95	48.39	19.05
97	48.77	19.20
98	49.40	19.45
99	49.66	19.55
max	50.29	19.80



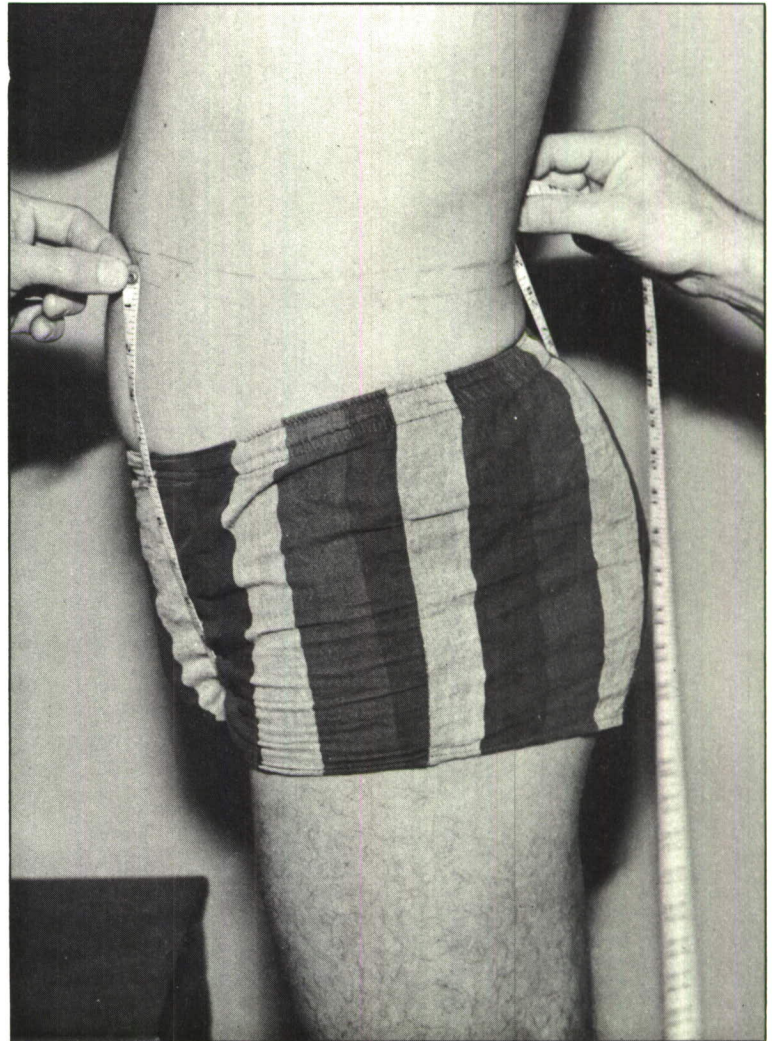
Mean: 45.075 (0.151) cm; 17.746 (0.059) in  
Standard deviation: 2.116 (0.106) cm; 0.833 (0.042) in  
Coefficient of variation: 4.694 (0.235) %  
Range: 39.62–50.29 cm; 15.60–19.80 in  
No. of subjects: 200

Table 38  
SHOULDER BREADTH

Measure the distance from the front waistline datum vertically down through the crotch and up to the waist line at centre back, tape to pass to the side of the genitals.

## PERCENTILE VALUES

%	cm	in
min	59.18	23.30
1	61.21	24.10
2	62.99	24.80
3	63.63	25.05
5	64.01	25.20
10	64.90	25.55
15	65.98	25.98
20	66.85	26.32
25	67.82	26.70
30	68.35	26.91
35	68.58	27.00
40	69.17	27.23
45	69.70	27.44
50	70.23	27.65
55	71.12	28.00
60	72.14	28.40
65	72.60	28.58
70	73.22	28.83
75	73.85	29.08
80	74.42	29.30
85	75.06	29.55
90	76.20	30.00
95	77.98	30.70
97	78.99	31.10
98	79.50	31.30
99	81.79	32.20
max	87.12	34.30



Mean: 70.841 (0.312) cm; 27.890 (0.123) in  
 Standard deviation: 4.417 (0.221) cm; 1.739 (0.087) in  
 Coefficient of variation: 6.235 (0.312) %  
 Range: 59.18–87.12 cm; 23.30–34.30 in  
 No. of subjects: 200

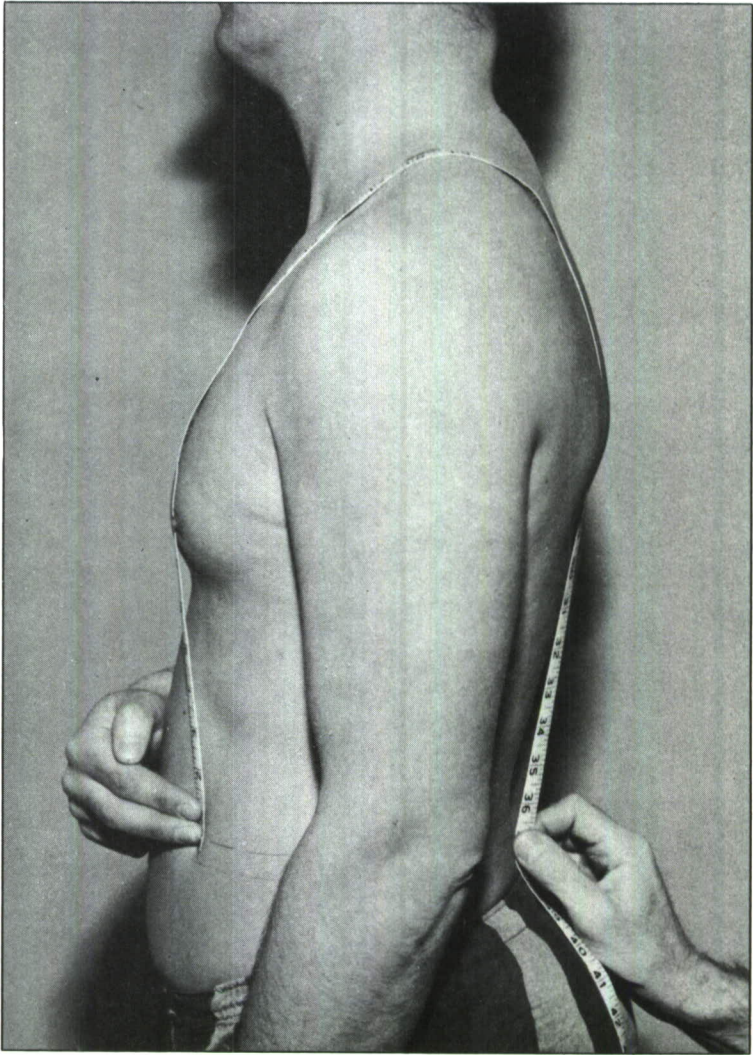
Table 39  
 WAIST TO WAIST – UNDER CROTCH



Measure the distance from the front waistline datum vertically up over the shoulder datum mark and vertically down to the waistline datum at back.

PERCENTILE VALUES

%	cm	in
min	84.07	33.10
1	85.09	33.50
2	86.11	33.90
3	86.61	34.10
5	87.69	34.52
10	89.03	35.05
15	89.83	35.37
20	90.32	35.56
25	91.02	35.83
30	91.60	36.06
35	92.10	36.26
40	92.79	36.53
45	93.54	36.82
50	93.95	36.99
55	94.49	37.20
60	95.19	37.48
65	95.54	37.61
70	96.01	37.80
75	96.82	38.12
80	97.66	38.45
85	98.89	38.93
90	99.89	39.32
95	100.84	39.70
97	101.47	39.95
98	102.62	40.40
99	104.14	41.00
max	108.46	42.70



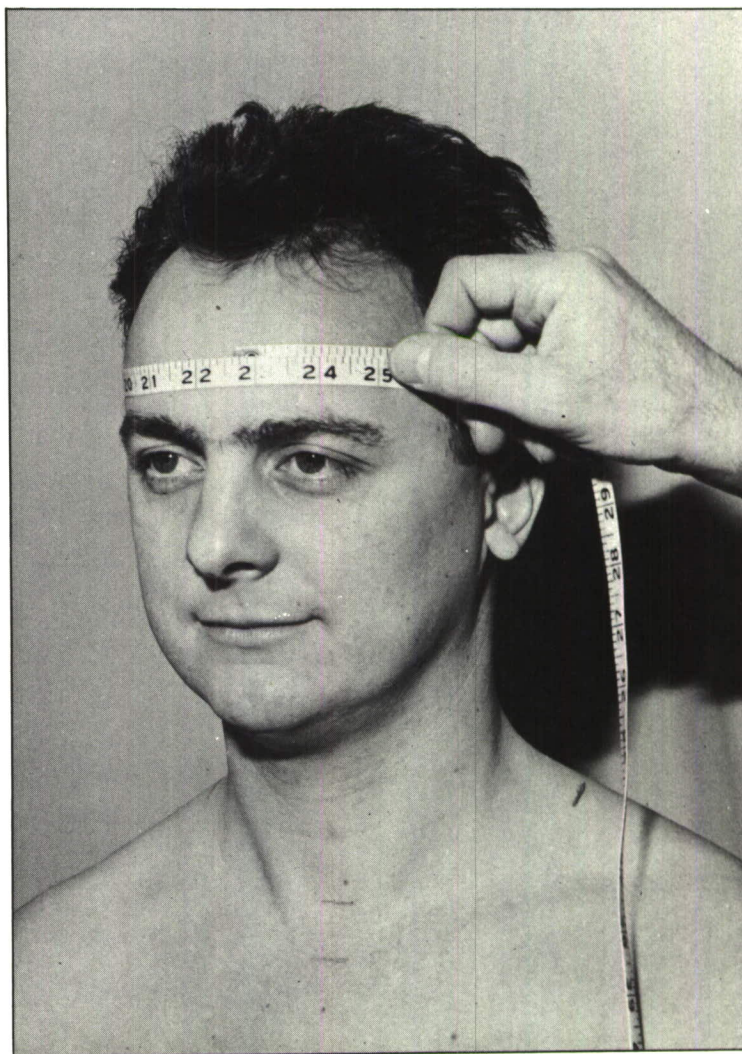
Mean: 94.244 (0.296) cm; 37.104 (0.117) in  
Standard deviation: 4.186 (0.209) cm; 1.648 (0.082) in  
Coefficient of variation: 4.442 (0.222) %  
Range: 84.07–108.46 cm; 33.10–42.70 in  
No. of subjects: 200

Table 40  
WAIST TO WAIST – OVER SHOULDER

Measure the maximum head girth with tape passing above the brow ridges.

# PERCENTILE VALUES

%	cm	in
min	53.59	21.10
1	54.10	21.30
2	54.74	21.55
3	54.99	21.65
5	55.40	21.81
10	56.06	22.07
15	56.34	22.18
20	56.59	22.28
25	56.92	22.41
30	57.11	22.48
35	57.28	22.55
40	57.45	22.62
45	57.66	22.70
50	57.83	22.77
55	58.00	22.83
60	58.17	22.90
65	58.32	22.96
70	58.50	23.03
75	58.69	23.11
80	58.86	23.17
85	59.23	23.32
90	59.69	23.50
95	60.28	23.73
97	60.45	23.80
98	60.79	23.93
99	60.96	24.00
max	61.47	24.20



Mean: 57.937 (0.099) cm; 22.810 (0.039) in  
 Standard deviation: 1.397 (0.070) cm; 0.550 (0.028) in  
 Coefficient of variation: 2.411 (0.121) %  
 Range: 53.59–61.47 cm; 21.10–24.20 in  
 No. of subjects: 200

Table 41  
HEAD GIRTH



## PERCENTILE VALUES

%	kg	lb
min	57.15	126.00
1	58.06	128.00
2	59.42	131.00
3	59.72	131.67
5	60.55	133.50
10	62.14	137.00
15	64.56	142.33
20	65.32	144.00
25	66.90	147.50
30	68.27	150.50
35	69.66	153.57
40	70.53	155.50
45	71.44	157.50
50	73.03	161.00
55	74.09	163.33
60	75.52	166.50
65	77.56	171.00
70	79.02	174.20
75	80.74	178.00
80	82.55	182.00
85	84.37	186.00
90	86.64	191.00
95	88.90	196.00
97	93.89	207.00
98	94.57	208.50
99	97.52	215.00
max	108.41	239.00

Mean: 74.314 (0.662) kg; 163.835 (1.459) lb  
 Standard deviation: 9.357 (0.468) kg; 20.629 (1.031) lb  
 Coefficient of variation: 12.591 (0.630) %  
 Range: 57.15–108.41 kg; 126.00–239.00 lb  
 No. of subjects: 200

Table 42  
 WEIGHT

Table 43(a)

## AGE

## PERCENTILE VALUES

%	Years
min	19.70
1	19.80
2	20.30
3	20.75
5	20.95
10	22.20
15	22.63
20	23.45
25	24.07
30	24.80
35	25.10
40	25.80
45	26.70
50	27.45
55	28.40
60	29.00
65	30.30
70	31.20
75	32.20
80	33.65
85	34.65
90	36.70
95	41.80
97	42.35
98	42.50
99	45.00
max	45.90

Mean: 28.730 (0.422) years  
 Standard deviation: 5.960 (0.298) years  
 Coefficient of variation: 20.745 (0.104) %  
 Range: 19.70-45.90 years  
 No. of subjects: 200

Table 43(b)  
SHOE SIZE (U.K.)

## PERCENTILE VALUES

%	Size
min	6.00
1	6.00
2	6.00
3	6.00
5	6.50
10	6.70
15	6.90
20	7.42
25	7.58
30	7.68
35	7.77
40	7.87
45	7.96
50	8.16
55	8.42
60	8.59
65	8.71
70	8.83
75	8.95
80	9.43
85	9.70
90	9.93
95	10.55
97	10.75
98	10.85
99	10.95
max	12.00

Mean: 8.537 (0.086)  
 Standard deviation: 1.221 (0.061)  
 Coefficient of variation: 14.303 (0.716) %  
 Range: 6.0-12.0  
 No. of subjects: 200

Table 43



(Measurement shewn at Table 15 minus measurement shewn at Table 4.)

PERCENTILE VALUES		
%	cm	in
min	3.56	1.40
1	3.62	1.42
2	3.75	1.48
3	3.84	1.51
5	3.97	1.56
10	4.35	1.71
15	4.63	1.82
20	4.77	1.88
25	4.90	1.93
30	5.01	1.97
35	5.12	2.02
40	5.23	2.06
45	5.34	2.10
50	5.45	2.15
55	5.56	2.19
60	5.64	2.22
65	5.71	2.25
70	5.78	2.27
75	5.86	2.31
80	6.03	2.37
85	6.20	2.44
90	6.39	2.51
95	6.72	2.64
97	6.83	2.69
98	6.98	2.75
99	7.37	2.90
max	8.38	3.30

Mean: 5.535 (0.056) cm  
 2.179 (0.022) in  
 Standard deviation: 0.795 (0.040) cm  
 0.313 (0.016) in  
 Coefficient of variation: 14.36 (0.718) %  
 Range: 3.56–8.38 cm; 1.40–3.30 in  
 No. of subjects: 200

Table 44(a)  
 TOP OF KNEE TO KNEE PIVOT

(Measurement shewn at Table 13 minus measurement shewn at Table 5.)

PERCENTILE VALUES		
%	cm	in
min	58.93	23.20
1	59.18	23.30
2	60.71	23.90
3	60.88	23.97
5	61.59	24.25
10	62.74	24.70
15	63.37	24.95
20	64.30	25.31
25	64.83	25.53
30	65.60	25.82
35	65.96	25.97
40	66.40	26.14
45	66.74	26.28
50	67.21	26.46
55	67.51	26.58
60	67.75	26.67
65	68.04	26.79
70	68.33	26.90
75	68.71	27.05
80	69.09	27.20
85	69.95	27.54
90	70.47	27.74
95	71.12	28.00
97	71.88	28.30
98	72.05	28.37
99	72.64	28.60
max	75.69	29.80

Mean: 66.937 (0.207) cm  
 26.353 (0.081) in  
 Standard deviation: 2.921 (0.146) cm  
 1.150 (0.058) in  
 Coefficient of variation: 4.36 (0.218) %  
 Range: 58.93–75.69 cm; 23.20–29.80 in  
 No. of subjects: 200

Table 44(b)  
 SHOULDER HEIGHT MINUS  
 CROTCH HEIGHT

(Measurement shewn at Table 9 minus measurement shewn at Table 6.)

(Measurement shewn at Table 7 minus measurement shewn at Table 5.)

PERCENTILE VALUES		
%	cm	in
min	37.08	14.60
1	37.34	14.70
2	37.97	14.95
3	38.86	15.30
5	40.39	15.90
10	41.01	16.14
15	41.49	16.33
20	42.08	16.57
25	42.53	16.74
30	42.89	16.89
35	43.31	17.05
40	43.65	17.19
45	43.90	17.28
50	44.15	17.38
55	44.55	17.54
60	44.90	17.68
65	45.26	17.82
70	45.57	17.94
75	45.90	18.07
80	46.35	18.25
85	46.84	18.44
90	47.50	18.70
95	48.51	19.10
97	48.94	19.27
98	49.28	19.40
99	49.53	19.50
max	52.07	20.50

Mean: 44.346 (0.182) cm  
 17.459 (0.072) in  
 Standard deviation: 2.570 (0.129) cm  
 1.012 (0.051) in  
 Coefficient of variation: 5.80 (0.260) %  
 Range: 37.08–52.07 cm; 14.60–20.50 in  
 No. of subjects: 200

Table 45(a)  
 AXILLARY HEIGHT MINUS WRIST HEIGHT

PERCENTILE VALUES		
%	cm	in
min	1.27	0.50
1	2.29	0.90
2	3.81	1.50
3	3.94	1.55
5	4.19	1.65
10	4.95	1.95
15	5.30	2.09
20	5.56	2.19
25	5.84	2.30
30	6.17	2.43
35	6.42	2.53
40	6.64	2.61
45	6.79	2.67
50	7.03	2.77
55	7.22	2.84
60	7.37	2.90
65	7.68	3.02
70	7.87	3.10
75	8.13	3.20
80	8.36	3.29
85	8.79	3.46
90	9.11	3.59
95	9.57	3.77
97	9.91	3.90
98	10.41	4.10
99	10.92	4.30
max	12.95	5.10

Mean: 7.130 (0.119) cm  
 2.807 (0.047) in  
 Standard deviation: 1.689 (0.084) cm  
 0.665 (0.033) in  
 Coefficient of variation: 23.69 (1.185) %  
 Range: 1.27–12.95 cm; 0.50–5.10 in  
 No. of subjects: 200

Table 45(b)  
 THIGH PIVOT HEIGHT MINUS  
 CROTCH HEIGHT

Table 45



(Measurement shewn at Table 14 minus measurement shewn at Table 13.)

PERCENTILE VALUES		
%	cm	in
min	24.38	9.60
1	24.38	9.60
2	24.38	9.60
3	24.64	9.70
5	24.89	9.80
10	25.50	10.04
15	25.77	10.15
20	25.95	10.22
25	26.06	10.26
30	26.16	10.30
35	26.31	10.36
40	26.47	10.42
45	26.65	10.49
50	26.90	10.59
55	27.06	10.65
60	27.21	10.71
65	27.38	10.78
70	27.58	10.86
75	27.81	10.95
80	28.04	11.04
85	28.25	11.12
90	28.70	11.30
95	29.21	11.50
97	29.72	11.70
98	29.97	11.80
99	30.23	11.90
max	31.50	12.40

Mean: 27.097 (0.092) cm  
 10.668 (0.036) in  
 Standard deviation: 1.295 (0.065) cm  
 0.510 (0.026) in  
 Coefficient of variation: 4.78 (0.239) %  
 Range: 24.38–31.50 cm; 9.60–12.40 in  
 No. of subjects: 200

Table 46(a)  
 HEIGHT (STATURE) MINUS  
 SHOULDER HEIGHT

(Measurement shewn at Table 21 minus measurement shewn at Table 20.)

PERCENTILE VALUES		
%	cm	in
min	0.25	0.10
1	0.25	0.10
2	0.38	0.15
3	0.51	0.20
5	0.63	0.25
10	0.95	0.37
15	1.12	0.44
20	1.24	0.49
25	1.35	0.53
30	1.45	0.57
35	1.56	0.61
40	1.66	0.65
45	1.77	0.70
50	1.86	0.73
55	1.94	0.77
60	2.03	0.80
65	2.12	0.83
70	2.21	0.87
75	2.30	0.91
80	2.43	0.96
85	2.58	1.01
90	2.76	1.09
95	3.00	1.18
97	3.43	1.35
98	3.64	1.43
99	3.81	1.50
max	4.57	1.80

Mean: 1.984 (0.052) cm  
 0.781 (0.021) in  
 Standard deviation: 0.739 (0.037) cm  
 0.291 (0.015) in  
 Coefficient of variation: 37.26 (1.863) %  
 Range: 0.25–4.57 cm; 0.10–1.80 in  
 No. of subjects: 200

Table 46(b)  
 ANKLE GIRTH 2½ INCHES ABOVE  
 MINIMUM, MINUS MINIMUM  
 ANKLE GIRTH

Table 46

(Measurement shewn at Table 30 minus measurement shewn at Table 29.)

PERCENTILE VALUES		
%	cm	in
min	1.02	0.40
1	1.02	0.40
2	1.27	0.50
3	1.34	0.53
5	1.49	0.59
10	1.73	0.68
15	1.90	0.75
20	2.06	0.81
25	2.18	0.86
30	2.30	0.91
35	2.38	0.94
40	2.47	0.97
45	2.55	1.00
50	2.62	1.03
55	2.68	1.06
60	2.75	1.08
65	2.83	1.12
70	2.94	1.16
75	3.04	1.20
80	3.21	1.26
85	3.39	1.33
90	3.56	1.40
95	3.77	1.48
97	3.94	1.55
98	4.06	1.60
99	4.57	1.80
max	4.83	1.90

Mean: 2.756 (0.049) cm  
 1.085 (0.019) in  
 Standard deviation: 0.699 (0.035) cm  
 0.275 (0.014) in  
 Coefficient of variation: 25.34 (1.267) %  
 Range: 1.02–4.83 cm; 0.40–1.90 in  
 No. of subjects: 200

Table 47(a)

WRIST GIRTH 2½ INCHES ABOVE  
 MINIMUM (PROXIMAL EDGE OF  
 STYLOID PROCESS) MINUS WRIST  
 GIRTH AT PROXIMAL EDGE  
 OF STYLOID PROCESS

(Measurement shewn at Table 9 minus measurement shewn at Table 8.)

PERCENTILE VALUES		
%	cm	in
min	18.54	7.30
1	18.71	7.37
2	19.05	7.50
3	19.43	7.65
5	19.94	7.85
10	20.91	8.23
15	21.59	8.50
20	22.01	8.67
25	22.42	8.82
30	22.64	8.91
35	23.01	9.06
40	23.39	9.21
45	23.64	9.31
50	23.85	9.39
55	24.16	9.51
60	24.44	9.62
65	24.70	9.72
70	24.91	9.81
75	25.12	9.89
80	25.37	9.99
85	25.63	10.09
90	26.12	10.28
95	26.92	10.60
97	27.30	10.75
98	27.94	11.00
99	28.79	11.33
max	28.96	11.40

Mean: 23.853 (0.146) cm  
 9.391 (0.058) in  
 Standard deviation: 2.070 (0.104) cm  
 0.815 (0.041) in  
 Coefficient of variation: 8.68 (0.434) %  
 Range: 18.54–28.96 cm; 7.30–11.40 in  
 No. of subjects: 200

Table 47(b)

AXILLARY HEIGHT MINUS  
 WAIST HEIGHT

Table 47



(Measurement shewn at Table 8 minus measurement shewn at Table 7.)

(Measurement shewn at Table 7 minus measurement shewn at Table 4.)

PERCENTILE VALUES		
%	cm	in
min	13.72	5.40
1	13.72	5.40
2	14.99	5.90
3	15.24	6.00
5	15.49	6.10
10	16.32	6.42
15	16.76	6.60
20	17.22	6.78
25	17.70	6.97
30	18.14	7.14
35	18.39	7.24
40	18.56	7.31
45	18.77	7.39
50	18.97	7.47
55	19.24	7.58
60	19.60	7.72
65	19.85	7.81
70	20.14	7.93
75	20.32	8.00
80	20.67	8.14
85	20.91	8.23
90	21.23	8.36
95	21.84	8.60
97	22.29	8.77
98	22.61	8.90
99	22.86	9.00
max	24.38	9.60

Mean: 19.083 (0.137) cm  
7.513 (0.054) in  
Standard deviation: 1.936 (0.097) cm  
0.762 (0.038) in  
Coefficient of variation: 10.14 (0.507) %  
Range: 13.72–24.38 cm; 5.40–9.60 in  
No. of subjects: 200

Table 48(a)  
WAIST HEIGHT MINUS THIGH  
PIVOT HEIGHT

PERCENTILE VALUES		
%	cm	in
min	33.78	13.30
1	34.04	13.40
2	34.71	13.67
3	35.81	14.10
5	36.26	14.28
10	36.87	14.52
15	37.46	14.75
20	37.82	14.89
25	38.20	15.04
30	38.61	15.20
35	38.98	15.35
40	39.22	15.44
45	39.54	15.57
50	39.80	15.67
55	40.10	15.79
60	40.43	15.92
65	40.77	16.05
70	41.08	16.17
75	41.59	16.37
80	41.99	16.53
85	42.31	16.66
90	42.71	16.81
95	43.18	17.00
97	43.94	17.30
98	44.45	17.50
99	45.08	17.75
max	49.78	19.60

Mean: 39.985 (0.165) cm  
15.742 (0.065) in  
Standard deviation: 2.334 (0.117) cm  
0.919 (0.046) in  
Coefficient of variation: 5.83 (0.292) %  
Range: 33.78–49.78 cm; 13.30–19.60 in  
No. of subjects: 200

Table 48(b)  
THIGH PIVOT HEIGHT MINUS  
KNEE PIVOT HEIGHT

Table 48

(Measurement shewn at Table 7 minus measurement shewn at Table 3.)

(Measurement shewn at Table 8 minus measurement shewn at Table 5.)

PERCENTILE VALUES		
%	cm	in
min	67.06	26.40
1	67.82	26.70
2	69.34	27.30
3	69.60	27.40
5	70.61	27.80
10	72.52	28.55
15	73.22	28.82
20	73.85	29.07
25	74.86	29.47
30	75.23	29.62
35	75.82	29.85
40	76.39	30.07
45	76.79	30.23
50	77.39	30.47
55	77.72	30.60
60	78.08	30.74
65	78.45	30.89
70	79.50	31.30
75	79.81	31.42
80	80.33	31.63
85	81.03	31.90
90	81.72	32.18
95	83.31	32.80
97	84.58	33.30
98	86.36	34.00
99	87.38	34.40
max	91.69	36.10

Mean: 77.373 (0.277) cm  
 30.462 (0.109) in  
 Standard deviation: 3.919 (0.196) cm  
 1.543 (0.077) in  
 Coefficient of variation: 5.07 (0.254) %  
 Range: 67.06–91.69 cm; 26.40–36.10 in  
 No. of subjects: 200

Table 49(a)

THIGH PIVOT HEIGHT MINUS  
 MINIMUM ANKLE GIRTH HEIGHT

PERCENTILE VALUES		
%	cm	in
min	20.57	8.10
1	21.08	8.30
2	21.34	8.40
3	21.59	8.50
5	22.10	8.70
10	23.21	9.14
15	23.51	9.26
20	23.81	9.38
25	24.47	9.63
30	24.81	9.77
35	25.23	9.93
40	25.53	10.05
45	25.84	10.17
50	26.11	10.28
55	26.50	10.43
60	26.92	10.60
65	27.21	10.71
70	27.51	10.83
75	27.84	10.96
80	28.22	11.11
85	28.55	11.24
90	28.99	11.41
95	29.40	11.57
97	30.23	11.90
98	30.35	11.95
99	30.48	12.00
max	31.75	12.50

Mean: 26.213 (0.162) cm  
 10.32 (0.063) in  
 Standard deviation: 2.286 (0.114) cm  
 0.900 (0.045) in  
 Coefficient of variation: 8.72 (0.436) %  
 Range: 20.57–31.75 cm; 8.10–12.50 in  
 No. of subjects: 200

Table 49(b)

WAIST HEIGHT MINUS  
 CROTCH HEIGHT

Table 49



(Measurement shewn at Table 9 minus measurement shewn at Table 5.)

PERCENTILE VALUES

%	cm	in
min	41.66	16.40
1	42.67	16.80
2	44.20	17.40
3	44.96	17.70
5	45.47	17.90
10	46.40	18.27
15	47.24	18.60
20	47.85	18.84
25	48.20	18.98
30	48.67	19.16
35	49.02	19.30
40	49.45	19.47
45	49.76	19.59
50	49.99	19.68
55	50.42	19.85
60	50.82	20.01
65	51.03	20.09
70	51.28	20.19
75	51.52	20.28
80	52.01	20.47
85	52.68	20.74
90	53.34	21.00
95	54.29	21.37
97	54.86	21.60
98	55.03	21.67
99	55.50	21.85
max	56.39	22.20

Mean: 50.063 (0.187) cm; 19.710 (0.074) in  
 Standard deviation: 2.642 (0.132) cm; 1.040 (0.052) in  
 Coefficient of variation: 5.28 (0.264) %  
 Range: 41.66–56.39 cm; 16.40–22.20 in  
 No. of subjects: 200

Table 50  
 AXILLARY HEIGHT MINUS CROTCH HEIGHT



Table 51 – Part 1

Serial No.	1st Control - Chest Girth			2nd Control - Torso Hoop			No. in Group	Total Range
	Min	Max	S.D.	Min	Max	S.D.		
2	Weight lb	130	145	137.1	142	148	9.566	126
3	Chest girth	34.5	36.8	35.98	36.9	36.11	0.664	34
4	Av. Torso hoop	59.2	61.3	60.48	63.9	64.86	0.658	56.9
5	Min Ankle girth, height	4.1	5.1	4.85	5.5	5.2	0.4	4
6	Knee pivot height	17.7	20	18.22	20.5	20.27	0.638	16.6
7	Crotch height	29.5	33.8	31.69	35	34.5	1.253	28.5
8	Wrist height	31.2	35.3	33.28	36.2	35.5	0.912	31.2
9	Thigh pivot height	32.5	36.2	34.04	36.9	34.97	1.347	31.1
10	Waist height	39.2	43.2	41.02	44.7	42.57	1.519	38.2
11	Axillary height	48.1	53	50.31	54.5	52.16	1.642	47.3
12	Supra-sternal height	53.2	56.2	53.96	58.1	56.37	1.542	51.6
13	Neck root height	53.2	57.2	54.92	59	57.29	1.55	52.3
14	7th Cervical height	55.1	59.8	57.2	61.9	59.54	1.489	54
15	Shoulder height 34" from CL	54.7	58.6	56.29	60.5	58.86	1.587	53.4
16	Height (Stature)	65	69.6	66.84	72.1	69.64	1.895	63.7
17	Knee height - sitting	20.1	22.6	21.49	22.6	21.33	0.67	19.1
18	Buttock - Knee Length	22	24.5	23.35	24.5	23.21	0.66	21.2
19	Heel/Instep girth	11.5	13.9	12.43	13	12.62	0.444	11.5
20	Sitting height	33.8	38.5	35.12	38.8	37.14	0.716	33.8
21	Knee girth, fully flexed	15	17.6	16.15	18.1	17.9	0.672	15
22	Ankle - girth min.	Min	Max	Mean	Min	Max	S.D.	



Table 51 – Part 2

TRIVARIATE TABLES – SPECIMEN 9 SIZE ROLL BASED ON CHEST GIRTH/TORSO HOOP CONTROLS

24	Ankle girth 2 1/4" above min.	Min 8.6	Mean 9.075	S.D. 0.270	Max 9.6
25	Calf girth	Min 12.4	Mean 13.48	S.D. 0.420	Max 15.2
26	Small girth	Min 11.8	Mean 13.3	S.D. 0.424	Max 14.6
27	Knee girth, standing	Min 13.3	Mean 14.48	S.D. 0.439	Max 15.2
28	Thigh girth, max	Min 18.2	Mean 20.43	S.D. 0.557	Max 22.2
29	Buttock girth	Min 34.3	Mean 36.39	S.D. 0.568	Max 37.3
30	Waist girth	Min 28.3	Mean 30.29	S.D. 1.229	Max 32.8
31	Neck girth	Min 13.1	Mean 14.7	S.D. 0.375	Max 15.2
32	Wrist girth	Min 6.1	Mean 6.662	S.D. 0.186	Max 7.1
33	Wrist girth	Min 6.9	Mean 7.1	S.D. 0.233	Max 7.6
34	Wrist girth 2 1/4" above min	Min 7.1	Mean 7.592	S.D. 0.344	Max 8.2
35	Elbow girth - fully flexed	Min 12	Mean 13.15	S.D. 0.622	Max 14.6
36	Biceps extended	Min 9.8	Mean 10.57	S.D. 0.394	Max 11.3
37	Biceps contracted	Min 10.7	Mean 11.7	S.D. 0.393	Max 12.2
38	Inter wrist span	Min 48.9	Mean 51.55	S.D. 1.588	Max 54
39	Inter elbow span	Min 35.3	Mean 36.7	S.D. 1.07	Max 38.06
40	Elbow - wrist length	Min 9.1	Mean 9.87	S.D. 0.429	Max 10.9
41	Shoulder - fingertip length	Min 30.1	Mean 31.82	S.D. 1.09	Max 33.31
42	Shoulder breadth	Min 15.6	Mean 16.76	S.D. 0.614	Max 17.8
43	Waist to waist throat crotch	Min 24.8	Mean 25.84	S.D. 0.825	Max 27.1
44	Waist to waist over shoulder	Min 33.1	Mean 35.07	S.D. 0.979	Max 37
45	Shoe size	Min 10	Mean 10.533	S.D. 0.289	Max 12
46	Head girth	Min 21.7	Mean 22.38	S.D. 0.449	Max 23

\* Measures used in RAE pattern drafting system.

+ Measures not normally recorded in anthropometric surveys.  
 b Measures taken to determine if a constant dimension could

6 Measures taken to determine if a constant dimension could be used in the RAE pattern drafting system.



Table 51 - Part 3  
TRIVARIATE TABLES - SPECIMEN 9 SIZE ROLL BASED ON CHEST GIRTH/TORSO HOOP CONTROLS

Mercury Serial No.	1st Control - Chest Girth			2nd Control - Torso Hoop			No. in Group			Total Range		
	Min	Max	S.D.	Min	Max	S.D.	Min	Max	S.D.	Min	Max	S.D.
50	Knee top to Knee pivot (17-6)			Torso length (15-7)			Ankle circumference taper over 2 1/4" (24-22)			Wrist circumference taper over 2 1/4" (34-33)		
	1.6	2.4	0.215	23.2	24.6	0.77	0.7	1.4	0.992	0.7	1.4	0.992
51												
	1.6	2.5	0.247	24.7	27.8	0.722	0.4	1.3	0.931	0.4	1.3	0.931
52												
	15.1	18	0.892	15.8	19.2	0.722	0.7	1.4	0.931	0.7	1.4	0.931
54												
	10	11.9	0.510	10	11.9	0.510	0.3	1.2	0.669	0.3	1.2	0.669
55												
	10	11.9	0.510	10	11.9	0.510	0.3	1.2	0.669	0.3	1.2	0.669
56												
	10	11.9	0.510	10	11.9	0.510	0.3	1.2	0.669	0.3	1.2	0.669
57												
	10	11.9	0.510	10	11.9	0.510	0.3	1.2	0.669	0.3	1.2	0.669
58												
	10	11.9	0.510	10	11.9	0.510	0.3	1.2	0.669	0.3	1.2	0.669
59												
	10	11.9	0.510	10	11.9	0.510	0.3	1.2	0.669	0.3	1.2	0.669
60												
	10	11.9	0.510	10	11.9	0.510	0.3	1.2	0.669	0.3	1.2	0.669
61												
	10	11.9	0.510	10	11.9	0.510	0.3	1.2	0.669	0.3	1.2	0.669
62												
	10	11.9	0.510	10	11.9	0.510	0.3	1.2	0.669	0.3	1.2	0.669



[illegible]



24	Ankle girth	Min	8.5	Max	10.4	Mean	9.346	S.D.	0.333
25	Calf girth	Min	12.7	Max	14.4	Mean	13.631	S.D.	0.429
26	Small girth	Min	12.1	Max	14.6	Mean	13.29	S.D.	0.367
27	Knee girth, standing	Min	13.7	Max	15.5	Mean	14.308	S.D.	0.377
28	Thigh girth, max	Min	19.9	Max	21.4	Mean	20.7	S.D.	0.481
29	Buttock girth	Min	34.3	Max	39.4	Mean	36.438	S.D.	1.152
30	Waist girth	Min	28.3	Max	32.5	Mean	30.485	S.D.	1.551
31	Neck girth	Min	13.6	Max	15.2	Mean	14.462	S.D.	0.395
32	Neck girth	Min	13.1	Max	14.5	Mean	13.8	S.D.	0.372
33	Wrist girth	Min	6.4	Max	7.1	Mean	6.623	S.D.	0.169
34	Wrist girth	Min	7.1	Max	8.4	Mean	7.731	S.D.	0.357
35	Elbow girth - fully flexed	Min	12.4	Max	14.6	Mean	13.5069	S.D.	0.613
36	Biceps extended	Min	9.3	Max	10.3	Mean	9.85	S.D.	0.147
37	Biceps contracted	Min	10.7	Max	12.2	Mean	11.485	S.D.	0.254
38	Inter wrist span	Min	48	Max	54	Mean	50.723	S.D.	1.445
39	Inter elbow span	Min	35	Max	39.4	Mean	36.492	S.D.	1.103
40	Elbow - wrist length	Min	9.1	Max	10.2	Mean	9.6	S.D.	0.314
41	Shoulder - fingertip length	Min	30.1	Max	33.1	Mean	31.223	S.D.	0.934
42	Shoulder breadth	Min	15.6	Max	17.8	Mean	16.9	S.D.	0.639
43	Waist to waist through crotch	Min	23.3	Max	28	Mean	25.854	S.D.	1.381
44	Waist to waist over shoulder	Min	33.1	Max	38.1	Mean	35.323	S.D.	1.279
45	Shoe size	Min	6	Max	10	Mean	7.115	S.D.	1.044
46	Head girth	Min	21.1	Max	23.3	Mean	22.331	S.D.	0.609

Table 52 - Part 2

TRIVARIATE TABLES - SPECIMEN 9 SIZE ROLL BASED ON CHEST GIRTH/STATURE CONTROLS



Table 52 - Part 3  
TRIVARIATE TABLES - SPECIMEN 9 SIZE ROLL BASED ON CHEST GIRTH/STATURE CONTROLS

Serial No.	1st Control - Chest girth	2nd Control - Stature	No. in Group	Chest/Stature Groupings									
				Up to 36.9		37.0 - 39.9		40.0 - 42.9		43-45.9		Total Range	
50	Knee top to Knee pivot (17-6)	Min Mean Max S.D.	16 1.995 2.5 0.233	1.6 2.4 3.3 0.313	2.1 2.8 3.3 0.27	2 3.3 2.573 0.306	1.4 2.8 2.2 0.338	1.4 2.2 2.2 0.338	2 3.3 2.573 0.306	2.1 2.8 3.3 0.27	2.1 2.8 3.3 0.27	1.4 2.179 3.3 0.313	1.4 2.179 3.3 0.313
				23.2 24.5 26.9 0.810	24.5 26.9 28.4 0.719	24.5 26.9 28.4 0.806	24.5 26.9 28.4 0.887	24.5 26.9 28.4 0.887	24.5 26.9 28.4 0.806	24.5 26.9 28.4 0.719	24.5 26.9 28.4 0.719	23.2 26.35 29.8 1.150	23.2 26.35 29.8 1.150
51	Torso Length (15-7)	Min Mean Max S.D.	10.3 10.9 11.2 0.284	9.8 10.362 10.757 0.318	9.8 10.362 10.757 0.318	9.8 10.362 10.757 0.318	9.8 10.362 10.757 0.318	9.8 10.362 10.757 0.318	9.8 10.362 10.757 0.318	9.8 10.362 10.757 0.318	9.8 10.362 10.757 0.318	9.6 10.67 12.4 0.510	9.6 10.67 12.4 0.510
				15.1 16.2 16.7 0.810	15.1 16.2 16.7 0.810	15.1 16.2 16.7 0.810	15.1 16.2 16.7 0.810	15.1 16.2 16.7 0.810	15.1 16.2 16.7 0.810	15.1 16.2 16.7 0.810	15.1 16.2 16.7 0.810	14.6 17.46 20.5 1.012	14.6 17.46 20.5 1.012
52	Axilla - wrist (11-8)	Min Mean Max S.D.	10.3 10.9 11.2 0.284	9.8 10.362 10.757 0.318	9.8 10.362 10.757 0.318	9.8 10.362 10.757 0.318	9.8 10.362 10.757 0.318	9.8 10.362 10.757 0.318	9.8 10.362 10.757 0.318	9.8 10.362 10.757 0.318	9.8 10.362 10.757 0.318	9.6 10.67 12.4 0.510	9.6 10.67 12.4 0.510
				15.1 16.2 16.7 0.810	15.1 16.2 16.7 0.810	15.1 16.2 16.7 0.810	15.1 16.2 16.7 0.810	15.1 16.2 16.7 0.810	15.1 16.2 16.7 0.810	15.1 16.2 16.7 0.810	15.1 16.2 16.7 0.810	14.6 17.46 20.5 1.012	14.6 17.46 20.5 1.012
55	Ankle Circumference over 2 1/4" (24-2)	Min Mean Max S.D.	0.6 0.838 1.1 0.260	0.6 0.838 1.1 0.260	0.6 0.838 1.1 0.260	0.6 0.838 1.1 0.260	0.6 0.838 1.1 0.260	0.6 0.838 1.1 0.260	0.6 0.838 1.1 0.260	0.6 0.838 1.1 0.260	0.6 0.838 1.1 0.260	0.1 0.781 1.8 0.291	0.1 0.781 1.8 0.291
				0.7 1.08 1.6 0.266	0.7 1.08 1.6 0.266	0.7 1.08 1.6 0.266	0.7 1.08 1.6 0.266	0.7 1.08 1.6 0.266	0.7 1.08 1.6 0.266	0.7 1.08 1.6 0.266	0.7 1.08 1.6 0.266	0.4 1.085 1.9 0.275	0.4 1.085 1.9 0.275
56	Wrist Circumference over 2 1/4" (34-33)	Min Mean Max S.D.	0.4 0.829 1.3 0.223	0.4 0.829 1.3 0.223	0.4 0.829 1.3 0.223	0.4 0.829 1.3 0.223	0.4 0.829 1.3 0.223	0.4 0.829 1.3 0.223	0.4 0.829 1.3 0.223	0.4 0.829 1.3 0.223	0.4 0.829 1.3 0.223	0.4 1.085 1.9 0.275	0.4 1.085 1.9 0.275
				0.7 1.08 1.6 0.266	0.7 1.08 1.6 0.266	0.7 1.08 1.6 0.266	0.7 1.08 1.6 0.266	0.7 1.08 1.6 0.266	0.7 1.08 1.6 0.266	0.7 1.08 1.6 0.266	0.7 1.08 1.6 0.266	0.4 1.085 1.9 0.275	0.4 1.085 1.9 0.275
57	Axilla - waist (11-10)	Min Mean Max S.D.	8.7 9.462 10.3 0.610	7.8 9.254 10.1 0.783	7.8 9.254 10.1 0.783	7.8 9.254 10.1 0.783	7.8 9.254 10.1 0.783	7.8 9.254 10.1 0.783	7.8 9.254 10.1 0.783	7.8 9.254 10.1 0.783	7.8 9.254 10.1 0.783	7.3 9.391 11.4 0.815	7.3 9.391 11.4 0.815
				6 8.2 8.3 0.645	6 8.2 8.3 0.645	6 8.2 8.3 0.645	6 8.2 8.3 0.645	6 8.2 8.3 0.645	6 8.2 8.3 0.645	6 8.2 8.3 0.645	6 8.2 8.3 0.645	5.4 9.6 9.6 0.815	5.4 9.6 9.6 0.815
58	Waist - thigh pivot (10-9)	Min Mean Max S.D.	15 16.157 17 0.620	13.8 15.7 15.7 0.620	13.8 15.7 15.7 0.620	13.8 15.7 15.7 0.620	13.8 15.7 15.7 0.620	13.8 15.7 15.7 0.620	13.8 15.7 15.7 0.620	13.8 15.7 15.7 0.620	13.8 15.7 15.7 0.620	13.3 15.4 17.1 0.638	13.3 15.4 17.1 0.638
				14.3 15.2 15.2 0.627	14.3 15.2 15.2 0.627	14.3 15.2 15.2 0.627	14.3 15.2 15.2 0.627	14.3 15.2 15.2 0.627	14.3 15.2 15.2 0.627	14.3 15.2 15.2 0.627	14.3 15.2 15.2 0.627	13.3 15.4 17.1 0.638	13.3 15.4 17.1 0.638
59	Thigh pivot - Knee pivot (9-6)	Min Mean Max S.D.	14.3 15.2 15.2 0.627	13.8 15.7 15.7 0.620	13.8 15.7 15.7 0.620	13.8 15.7 15.7 0.620	13.8 15.7 15.7 0.620	13.8 15.7 15.7 0.620	13.8 15.7 15.7 0.620	13.8 15.7 15.7 0.620	13.8 15.7 15.7 0.620	13.3 15.4 17.1 0.638	13.3 15.4 17.1 0.638
				14.3 15.2 15.2 0.627	14.3 15.2 15.2 0.627	14.3 15.2 15.2 0.627	14.3 15.2 15.2 0.627	14.3 15.2 15.2 0.627	14.3 15.2 15.2 0.627	14.3 15.2 15.2 0.627	14.3 15.2 15.2 0.627	13.3 15.4 17.1 0.638	13.3 15.4 17.1 0.638
60	Thigh pivot - Ankle (9-5)	Min Mean Max S.D.	26.4 27.7 29.8 0.620	26.4 27.7 29.8 0.620	26.4 27.7 29.8 0.620	26.4 27.7 29.8 0.620	26.4 27.7 29.8 0.620	26.4 27.7 29.8 0.620	26.4 27.7 29.8 0.620	26.4 27.7 29.8 0.620	26.4 27.7 29.8 0.620	26.4 27.7 29.8 0.620	26.4 27.7 29.8 0.620
				26.4 27.7 29.8 0.620	26.4 27.7 29.8 0.620	26.4 27.7 29.8 0.620	26.4 27.7 29.8 0.620	26.4 27.7 29.8 0.620	26.4 27.7 29.8 0.620	26.4 27.7 29.8 0.620	26.4 27.7 29.8 0.620	26.4 27.7 29.8 0.620	26.4 27.7 29.8 0.620
61	Waist-Crotch (10-7)	Min Mean Max S.D.	11.2 11.4 10.4 0.602	9.2 9.3 8.3 0.602	9.2 9.3 8.3 0.602	9.2 9.3 8.3 0.602	9.2 9.3 8.3 0.602	9.2 9.3 8.3 0.602	9.2 9.3 8.3 0.602	9.2 9.3 8.3 0.602	9.2 9.3 8.3 0.602	8.1 10.6 12.5 0.90	8.1 10.6 12.5 0.90
				11.2 11.4 10.4 0.602	11.2 11.4 10.4 0.602	11.2 11.4 10.4 0.602	11.2 11.4 10.4 0.602	11.2 11.4 10.4 0.602	11.2 11.4 10.4 0.602	11.2 11.4 10.4 0.602	11.2 11.4 10.4 0.602	8.1 10.6 12.5 0.90	8.1 10.6 12.5 0.90
62	Axilla-Crotch (11-7)	Min Mean Max S.D.	18.1 19.1 21.1 0.803	17.5 18.5 20.5 0.738	17.5 18.5 20.5 0.738	17.5 18.5 20.5 0.738	17.5 18.5 20.5 0.738	17.5 18.5 20.5 0.738	17.5 18.5 20.5 0.738	17.5 18.5 20.5 0.738	17.5 18.5 20.5 0.738	16.4 19.71 22.2 1.04	16.4 19.71 22.2 1.04



Serial No.	1st Control - Weight		2nd Control - Stature		No. in Group		Weight/Stature Groupings		Total	
	Up to 154 lb.		69.0 - 64.5		71.9		155 - 179		71.0 - 74.9	
	180 - 204	205-229	180	180	19	19	15	15	5	5
2	Weight lb	Min 128 Mean 138.231 S.D. 1.54	Max 154 Mean 142.862 S.D. 1.54	Min 126 Mean 141.963 S.D. 1.54	134	134	156 Mean 161.846 S.D. 6.914	156 Mean 161.846 S.D. 6.914	126 Mean 141.963 S.D. 1.54	126 Mean 141.963 S.D. 1.54
3	Chest girth	Min 34.9 Mean 36.454 S.D. 1.107	Max 39.5 Mean 36.769 S.D. 1.107	Min 34 Mean 36.352 S.D. 1.080	34	34	37.4 Mean 39.608 S.D. 1.623	37.4 Mean 39.608 S.D. 1.623	34 Mean 36.454 S.D. 1.107	34 Mean 36.454 S.D. 1.107
4	Av. Torso Hoop	Min 56.9 Mean 60.769 S.D. 1.783	Max 64.4 Mean 61.734 S.D. 1.783	Min 56.7 Mean 60.7 S.D. 1.647	60.7 Mean 61.734 S.D. 1.647	60.7 Mean 61.734 S.D. 1.647	61.1 Mean 64.884 S.D. 1.495	61.1 Mean 64.884 S.D. 1.495	56.9 Mean 60.769 S.D. 1.783	56.9 Mean 60.769 S.D. 1.783
5	Min Ankle girth, height	Min 4.1 Mean 4.654 S.D. 0.276	Max 5.1 Mean 4.821 S.D. 0.320	Min 4.1 Mean 4.654 S.D. 0.276	4.1 Mean 4.821 S.D. 0.320	4.1 Mean 4.821 S.D. 0.320	4.4 Mean 4.972 S.D. 0.305	4.4 Mean 4.972 S.D. 0.305	4.1 Mean 4.654 S.D. 0.276	4.1 Mean 4.654 S.D. 0.276
6	Knee pivot height	Min 16.6 Mean 18.069 S.D. 0.629	Max 20.3 Mean 19.048 S.D. 0.507	Min 16.6 Mean 18.069 S.D. 0.629	16.6 Mean 19.048 S.D. 0.507	16.6 Mean 19.048 S.D. 0.507	18.6 Mean 19.676 S.D. 0.499	18.6 Mean 19.676 S.D. 0.499	16.6 Mean 18.069 S.D. 0.629	16.6 Mean 18.069 S.D. 0.629
7	Crotch height	Min 28.9 Mean 30.231 S.D. 0.943	Max 32.1 Mean 31.545 S.D. 0.880	Min 28.9 Mean 30.231 S.D. 0.943	28.9 Mean 31.545 S.D. 0.880	28.9 Mean 31.545 S.D. 0.880	30.8 Mean 32.472 S.D. 0.8	30.8 Mean 32.472 S.D. 0.8	28.9 Mean 30.231 S.D. 0.943	28.9 Mean 30.231 S.D. 0.943
8	Waist height	Min 31.2 Mean 32.623 S.D. 0.854	Max 33.9 Mean 33.431 S.D. 0.713	Min 31.2 Mean 32.623 S.D. 0.854	31.2 Mean 33.431 S.D. 0.713	31.2 Mean 33.431 S.D. 0.713	32.9 Mean 35.016 S.D. 0.9	32.9 Mean 35.016 S.D. 0.9	31.2 Mean 32.623 S.D. 0.854	31.2 Mean 32.623 S.D. 0.854
9	Thigh pivot height	Min 32.4 Mean 33.5 S.D. 0.735	Max 36 Mean 34.276 S.D. 0.888	Min 32.4 Mean 33.5 S.D. 0.735	32.4 Mean 34.276 S.D. 0.888	32.4 Mean 34.276 S.D. 0.888	33.6 Mean 35.460 S.D. 0.851	33.6 Mean 35.460 S.D. 0.851	32.4 Mean 33.5 S.D. 0.735	32.4 Mean 33.5 S.D. 0.735
10	Waist height	Min 38.2 Mean 39.238 S.D. 0.790	Max 40.6 Mean 41.169 S.D. 0.997	Min 38.2 Mean 39.238 S.D. 0.790	38.2 Mean 41.169 S.D. 0.997	38.2 Mean 41.169 S.D. 0.997	41.2 Mean 42.890 S.D. 0.775	41.2 Mean 42.890 S.D. 0.775	38.2 Mean 39.238 S.D. 0.790	38.2 Mean 39.238 S.D. 0.790
11	Axillary height	Min 47.3 Mean 48.631 S.D. 0.850	Max 50.1 Mean 50.479 S.D. 0.831	Min 47.3 Mean 48.631 S.D. 0.850	47.3 Mean 50.479 S.D. 0.831	47.3 Mean 50.479 S.D. 0.831	50.6 Mean 52.092 S.D. 1.449	50.6 Mean 52.092 S.D. 1.449	47.3 Mean 48.631 S.D. 0.850	47.3 Mean 48.631 S.D. 0.850
12	Supra-sternal height	Min 51.5 Mean 52.569 S.D. 0.703	Max 53.8 Mean 54.783 S.D. 0.881	Min 51.5 Mean 52.569 S.D. 0.703	51.5 Mean 54.783 S.D. 0.881	51.5 Mean 54.783 S.D. 0.881	55.2 Mean 56.720 S.D. 0.841	55.2 Mean 56.720 S.D. 0.841	51.5 Mean 52.569 S.D. 0.703	51.5 Mean 52.569 S.D. 0.703
13	Neck root height	Min 52.3 Mean 53.431 S.D. 0.733	Max 54.4 Mean 55.652 S.D. 0.848	Min 52.3 Mean 53.431 S.D. 0.733	52.3 Mean 55.652 S.D. 0.848	52.3 Mean 55.652 S.D. 0.848	53.3 Mean 55.254 S.D. 0.891	53.3 Mean 55.254 S.D. 0.891	52.3 Mean 53.431 S.D. 0.733	52.3 Mean 53.431 S.D. 0.733
14	7th cervical height	Min 54 Mean 55.346 S.D. 0.750	Max 56.4 Mean 57.338 S.D. 0.897	Min 54 Mean 55.346 S.D. 0.750	54 Mean 57.338 S.D. 0.897	54 Mean 57.338 S.D. 0.897	57.6 Mean 59.876 S.D. 0.797	57.6 Mean 59.876 S.D. 0.797	54 Mean 55.346 S.D. 0.750	54 Mean 55.346 S.D. 0.750
15	Shoulder height 3/4 from CL	Min 53.4 Mean 54.723 S.D. 0.717	Max 55.7 Mean 56.893 S.D. 0.812	Min 53.4 Mean 54.723 S.D. 0.717	53.4 Mean 56.893 S.D. 0.812	53.4 Mean 56.893 S.D. 0.812	57.4 Mean 59.569 S.D. 0.911	57.4 Mean 59.569 S.D. 0.911	53.4 Mean 54.723 S.D. 0.717	53.4 Mean 54.723 S.D. 0.717
16	Height (Stature)	Min 63.7 Mean 65.046 S.D. 0.605	Max 68.9 Mean 67.690 S.D. 0.856	Min 63.7 Mean 65.046 S.D. 0.605	63.7 Mean 67.690 S.D. 0.856	63.7 Mean 67.690 S.D. 0.856	68 Mean 69.824 S.D. 0.960	68 Mean 69.824 S.D. 0.960	63.7 Mean 65.046 S.D. 0.605	63.7 Mean 65.046 S.D. 0.605
17	Knee height - sitting	Min 19.1 Mean 20.8 S.D. 0.503	Max 22.3 Mean 21.076 S.D. 0.515	Min 19.1 Mean 20.8 S.D. 0.503	19.1 Mean 21.076 S.D. 0.515	19.1 Mean 21.076 S.D. 0.515	22.1 Mean 22.5 S.D. 0.404	22.1 Mean 22.5 S.D. 0.404	19.1 Mean 20.8 S.D. 0.503	19.1 Mean 20.8 S.D. 0.503
18	Buttock - Knee length	Min 21.2 Mean 22.162 S.D. 0.544	Max 23.4 Mean 23.083 S.D. 0.551	Min 21.2 Mean 22.162 S.D. 0.544	21.2 Mean 23.083 S.D. 0.551	21.2 Mean 23.083 S.D. 0.551	23.1 Mean 24.082 S.D. 0.612	23.1 Mean 24.082 S.D. 0.612	21.2 Mean 22.162 S.D. 0.544	21.2 Mean 22.162 S.D. 0.544
19	Heel/Instep girth	Min 11.5 Mean 12.269 S.D. 0.373	Max 13.5 Mean 12.507 S.D. 0.351	Min 11.5 Mean 12.269 S.D. 0.373	11.5 Mean 12.507 S.D. 0.351	11.5 Mean 12.507 S.D. 0.351	12 Mean 12.99 S.D. 0.364	12 Mean 12.99 S.D. 0.364	11.5 Mean 12.269 S.D. 0.373	11.5 Mean 12.269 S.D. 0.373
20	Sitting height	Min 33.8 Mean 34.7 S.D. 0.704	Max 37 Mean 35.683 S.D. 0.663	Min 33.8 Mean 34.7 S.D. 0.704	33.8 Mean 35.683 S.D. 0.663	33.8 Mean 35.683 S.D. 0.663	35.1 Mean 36.706 S.D. 0.893	35.1 Mean 36.706 S.D. 0.893	33.8 Mean 34.7 S.D. 0.704	33.8 Mean 34.7 S.D. 0.704
21	Knee girth fully flexed	Min 15 Mean 15.985 S.D. 0.558	Max 17 Mean 16.348 S.D. 0.532	Min 15 Mean 15.985 S.D. 0.558	15 Mean 16.348 S.D. 0.532	15 Mean 16.348 S.D. 0.532	16 Mean 17.188 S.D. 0.553	16 Mean 17.188 S.D. 0.553	15 Mean 15.985 S.D. 0.558	15 Mean 15.985 S.D. 0.558
22	Ankle - girth min	Min 8 Mean 8.485 S.D. 0.339	Max 9.4 Mean 8.528 S.D. 0.345	Min 8 Mean 8.485 S.D. 0.339	8 Mean 8.528 S.D. 0.345	8 Mean 8.528 S.D. 0.345	8 Mean 8.926 S.D. 0.404	8 Mean 8.926 S.D. 0.404	8 Mean 8.485 S.D. 0.339	8 Mean 8.485 S.D. 0.339

Table 53 - Part 1

TRIVARIATE TABLES - SPECIMEN 9 SIZE ROLL BASED ON WEIGHT/STATURE CONTROLS



24	Ankle girth	Min	8.5	Max	10.4	Mean	9.262	S.D.	0.469
25	Calf girth	Min	12.5	Max	14.7	Mean	13.562	S.D.	0.565
26	Small girth	Min	11.8	Max	14.6	Mean	13.208	S.D.	0.459
27	Knee girth, standing	Min	13.6	Max	15.4	Mean	14.555	S.D.	0.482
28	Thigh girth, max	Min	19.4	Max	22.5	Mean	20.950	S.D.	0.950
29	Buttock girth	Min	34.3	Max	39.2	Mean	36.554	S.D.	1.531
30	Waist girth	Min	28.6	Max	34.3	Mean	30.946	S.D.	1.849
32	Neck girth	Min	13.5	Max	15.2	Mean	14.331	S.D.	0.425
33	Wrist girth	Min	6.4	Max	7.1	Mean	6.679	S.D.	0.208
34	Wrist girth 2" above min	Min	6.9	Max	8.2	Mean	7.686	S.D.	0.304
35	Elbow girth - fully flexed	Min	12.4	Max	14.3	Mean	13.038	S.D.	0.571
36	Biceps extended	Min	10.3	Max	11.8	Mean	10.938	S.D.	0.594
37	Biceps contracted	Min	10.7	Max	12.7	Mean	11.931	S.D.	0.437
38	Inter wrist span	Min	48	Max	56.9	Mean	52.248	S.D.	1.811
39	Inter elbow span	Min	34.6	Max	39.5	Mean	37.054	S.D.	1.289
40	Elbow - wrist length	Min	8.9	Max	10.8	Mean	9.966	S.D.	0.399
41	Shoulder - fingertip length	Min	29.6	Max	34.8	Mean	30.869	S.D.	1.136
42	Shoulder breadth	Min	15.6	Max	17.7	Mean	16.662	S.D.	0.598
43	Waist to waist thro' crotch	Min	23.3	Max	28	Mean	25.731	S.D.	1.339
44	Waist to waist over shoulder	Min	34.1	Max	38.1	Mean	35.677	S.D.	1.064
45	Shoe size	Min	6	Max	8	Mean	6.962	S.D.	0.660
46	Head girth	Min	21.1	Max	23.3	Mean	22.323	S.D.	0.614



Serial No.	1st Control - Weight	2nd Control - Stature	No. in Group	Weight/Stature Groupings										Total Range
				Up to 154 lb		155 - 179		180 - 204		205-229				
50	Knee top to Knee pivot (17-6)	Min 1.5 Max 2.7 Mean 2.085 S.D. 0.339	13	1.7 2.5 2.111 0.212	1.4 2.5 2.146 0.288	1.6 2.8 2.22 0.359	1.5 2.7 2.405 0.331	1.9 3.3 2.540 0.321	2 2.8 2.340 0.321	26.8 28.8 27.6 0.803	14.6 16.7 15.8 0.856	17.8 19.5 18.9 0.856	17.46 20.5 17.940 1.012	
51	Torso length (15-7)	Min 23.2 Max 25.8 Mean 24.492 S.D. 0.720	29	24 27.9 26.141 0.934	24.5 28.4 26.610 0.734	25.9 28.4 27.060 0.765	25.8 28.6 27.226 0.542	24 28.6 27.226 1.058	26.8 28.8 27.6 0.803	14.7 16.7 15.8 0.856	16.7 17.8 17.5 0.856	17.8 19.5 18.9 0.856	17.46 20.5 17.940 1.012	
52	Axilla - wrist (11-8)	Min 14.8 Max 16.9 Mean 16.008 S.D. 0.645	29	15.8 19.1 17.048 0.729	14.6 18.9 16.862 0.982	15.3 19.3 17.416 0.877	14.7 18.7 17.379 0.881	16.7 19.5 17.8 0.717	16.7 19.5 17.8 0.856	14.7 16.7 15.8 0.856	16.7 17.8 17.5 0.856	17.8 19.5 18.9 0.856	17.46 20.5 17.940 1.012	
54	Head + Neck length (16-15)	Min 9.8 Max 11.1 Mean 10.323 S.D. 0.327	29	10.4 12.2 10.797 0.367	9.6 10.9 10.315 0.341	9.6 12.4 10.893 0.571	9.8 11.1 10.5 0.386	9.6 11.7 10.437 0.455	10.2 12.4 10.74 0.555	14.7 16.7 15.8 0.856	16.7 17.8 17.5 0.856	17.8 19.5 18.9 0.856	17.46 20.5 17.940 1.012	
55	Ankle circumference (24-22) taper over 2 1/2"	Min 0.6 Max 1.4 Mean 0.969 S.D. 0.269	13	0.3 1.2 0.707 0.262	0.5 1.5 0.915 0.346	0.2 1.5 0.607 0.258	0.3 1.8 0.942 0.315	0.3 1.7 0.774 0.338	0.7 1.1 0.880 0.148	14.7 16.7 15.8 0.856	16.7 17.8 17.5 0.856	17.8 19.5 18.9 0.856	17.46 20.5 17.940 1.012	
56	Wrist circumference (34-33) taper over 2 1/2"	Min 0.7 Max 1.6 Mean 1.208 S.D. 0.250	13	0.4 1.4 0.933 0.220	0.8 1.9 1.262 0.299	0.4 1.6 1.114 0.241	0.6 1.2 0.933 0.180	0.9 1.5 1.179 0.190	0.8 1.5 1.040 0.270	14.7 16.7 15.8 0.856	16.7 17.8 17.5 0.856	17.8 19.5 18.9 0.856	17.46 20.5 17.940 1.012	
57	Axilla - Wrist (11-10)	Min 8.1 Max 10.1 Mean 9.392 S.D. 0.539	13	7.3 10.7 9.010 0.782	7.5 11.4 9.008 1.172	7.5 10.5 9.572 0.751	7.9 10.3 9.063 0.698	8.3 10.3 9.447 0.654	8.3 11.4 9.920 1.119	14.7 16.7 15.8 0.856	16.7 17.8 17.5 0.856	17.8 19.5 18.9 0.856	17.46 20.5 17.940 1.012	
58	Wrist - thigh pivot (10-9)	Min 5.4 Max 7.8 Mean 6.708 S.D. 0.609	13	5.4 8.3 7.193 0.605	5.4 9 7.123 1.130	5.9 8.6 7.420 0.686	6.5 8.6 7.716 0.615	6.2 9.4 8.005 0.721	6.9 9 8.020 0.750	14.7 16.7 15.8 0.856	16.7 17.8 17.5 0.856	17.8 19.5 18.9 0.856	17.46 20.5 17.940 1.012	
59	Thigh pivot - Knee pivot (9-6)	Min 13.8 Max 15.3 Mean 14.462 S.D. 0.527	13	14.3 16.6 15.228 0.681	13.4 15.7 15.023 0.619	14.8 17.7 16.784 0.676	15.1 17.4 15.953 0.561	14.6 17.1 16.174 0.709	15.4 16.9 16.160 0.532	14.7 16.7 15.8 0.856	16.7 17.8 17.5 0.856	17.8 19.5 18.9 0.856	17.46 20.5 17.940 1.012	
60	Thigh pivot - Ankle pivot (9-5)	Min 26.4 Max 29 Mean 27.877 S.D. 0.897	13	27.7 31.5 29.455 0.969	28.9 31.8 30.7 0.811	27.4 32.8 30.488 0.860	29.5 33.4 32.060 0.925	28.2 34.4 31.295 1.296	31.1 36.1 30.46 0.903	14.7 16.7 15.8 0.856	16.7 17.8 17.5 0.856	17.8 19.5 18.9 0.856	17.46 20.5 17.940 1.012	
61	Wrist - Croch (10-7)	Min 8.5 Max 11.2 Mean 9.531 S.D. 0.950	13	8.1 11.8 9.966 0.854	8.4 12 9.907 0.794	8.6 12 10.362 0.776	9.8 11.6 10.627 0.619	9.4 12.2 10.758 0.665	9.9 11.6 10.580 0.676	14.7 16.7 15.8 0.856	16.7 17.8 17.5 0.856	17.8 19.5 18.9 0.856	17.46 20.5 17.940 1.012	
62	Axilla - Croch (11-7)	Min 17.5 Max 20.8 Mean 19.046 S.D. 1	13	16.4 22.2 19.197 1.253	18.5 22 19.623 1.057	18.4 21.7 19.998 0.856	17.7 21 19.987 0.785	17.3 21.7 20.342 1.015	19.8 22.2 20.5 0.758	14.7 16.7 15.8 0.856	16.7 17.8 17.5 0.856	17.8 19.5 18.9 0.856	17.46 20.5 17.940 1.012	

Table 53 - Part 3  
TRIVARIATE TABLES - SPECIMEN 9 SIZE ROLL BASED ON WEIGHT/STATURE CONTROLS



Subject	MM		NW		CR		SM
Date	2/12/1966		2/12/1966		23/11/1966		5/12/1966
Measured by	CBB	RES	CBB	RES	CBB	RES	
Chest girth	37.1	37.0	38.0	37.9	36.6	36.3	37.6
Average torso hoop	60.7	61.6	63.6	64.0	60.9	61.5	63.7
Min Ankle girth	4.6	4.7	5.6	5.7	5.0	5.1	5.3
Knee pivot height	18.4	18.4	19.7	19.8	19.7	19.7	20.7
Crotch height	31.2	31.5	33.5	33.7	33.2	33.5	34.8
Wrist height	33.2	32.9	35.8	36.3	33.5	34.0	36.9
Thigh pivot height	33.2	33.2	35.8	35.8	36.4	36.6	37.2
Waist height	41.0	40.9	44.2	44.3	42.7	42.7	43.9
Axillary height	50.5	50.3	53.0	53.3	51.5	51.6	54.8
Suprasternal height	54.3	54.5	56.9	57.0	55.9	56.4	58.1
Neck root height	55.1	55.2	57.7	57.9	56.8	57.2	59.0
7th cervical height	57.2	57.1	60.4	60.4	59.3	59.4	60.9
Shoulder height, $3\frac{1}{4}$ from GL	56.3	56.2	59.1	59.1	58.4	58.3	60.5
Height	67.0	67.1	69.9	69.9	69.1	69.5	70.5
Knee height sitting	20.9	21.0	22.2	22.3	22.1	22.1	23.0
Buttock-knee length	23.0	23.0	24.4	24.4	23.6	24.0	23.9
Heel/Instep girth	12.0	12.0	13.9	13.9	12.1	12.2	12.9
Sitting height	35.6	35.7	36.5	36.5	35.4	36.0	35.9
Knee girth, fully flexed	16.0	15.4	17.0	17.1	16.0	16.0	16.5
Ankle girth min	8.1	8.1	9.1	9.1	8.5	8.5	8.6
Ankle girth $2\frac{1}{2}$ " above min	8.7	8.7	10.0	10.1	9.3	9.3	9.5
Calf girth	12.7	12.6	15.3	15.2	13.7	13.6	15.6
Small girth	12.2	12.2	14.0	13.9	12.5	12.3	13.7
Knee girth, standing	14.7	14.5	15.6	15.4	14.5	14.1	15.3
Thigh girth, max.	20.8	20.7	21.9	22.0	21.2	21.2	23.4
Buttock girth	38.0	37.8	39.0	39.0	37.1	36.4	38.1
Waist girth	30.4	30.5	32.2	32.1	31.4	30.7	30.7
Neck girth	14.5	14.5	14.4	14.2	14.8	14.7	14.8
Wrist girth, min.	6.7	6.8	7.5	7.5	6.6	6.6	7.1
Wrist girth, $2\frac{1}{2}$ " above min	7.6	7.8	8.5	8.7	7.5	7.6	8.0
Elbow-girth fully flexed	14.0	14.1	14.5	14.4	14.0	13.5	14.7
Biceps, extended	11.6	11.0	11.4	10.8	11.5	11.3	12.2
Biceps, contracted	12.6	12.6	12.2	12.2	12.3	12.2	14.0
Inter wrist span	52.5	52.2	51.9	51.2	54.1	53.9	53.5
Inter elbow span	38.2	37.7	36.4	36.4	37.8	37.6	37.8
Elbow wrist length	10.0	9.9	10.0	9.9	10.8	10.6	10.7
Shoulder-fingertip length	32.8	32.6	32.7	32.9	33.6	33.7	33.4
Shoulder breadth	17.7	17.4	17.5	17.2	16.8	16.8	17.5
Waist-waist thro' crotch	26.4	27.0	29.4	29.0	26.0	25.6	26.2
Waist-waist over shoulder	34.5	35.5	35.3	35.6	35.2	35.6	38.5
Head girth	23.1	23.1	23.5	23.2	22.0	22.0	22.5

Table 54

COMPARISON OF MEASURES AND REPEATABILITY OF  
MEASUREMENT CHECK RESULTS

Computer Ref. No.	Measurement	Illustrated at Table No.	Men sizes (theoretical) in inches								
			1	2	3	4	5	6	7	8	9
3	Chest girth	1	36.9	36.9	36.9	39.9	39.9	39.9	42.9	42.9	45.9
4	Torso hoop	2	61.4	63.9	66.4	62.9	65.9	68.9	66.4	69.9	70.4
21	Knee girth, fully flexed	19	17.6	18.1	17.4	17.9	18.6	18.4	19.5	18.7	18.5
28	Thigh girth, max.	25	21.4	22.2	23.1	23.8	25.4	24.9	24.5	25.2	26.5
29	Buttock girth	26	37.3	39.1	39.4	40.7	41.5	42.0	42.5	43.0	43.2
30	Waist girth	27	32.8	33.3	32.6	34.4	37.5	36.1	39.8	38.3	41.5
32	Neck girth	28	14.7	15.2	15.0	15.8	17.3	16.0	16.2	17.2	16.0
35	Elbow girth, fully flexed	31	14.0	14.6	14.5	14.7	14.8	15.0	15.3	15.8	14.8
5	Min. ankle diameter height	3	4.8	4.9	4.9	4.9	5.1	5.1	5.0	5.1	5.1
6	Knee pivot height	4	18.9	19.5	19.3	19.2	19.9	20.3	19.8	20.3	20.6
7	Crotch height	5	31.7	32.4	32.1	32.0	33.0	33.4	32.5	33.3	34.2
9	Thigh pivot height	7	34.0	35.0	34.6	34.7	35.9	36.3	35.4	36.5	36.7
10	Waist height	8	41.0	42.4	42.6	41.8	43.5	44.1	43.2	44.1	45.2
11	Axillary height	9	50.3	51.9	52.2	50.9	52.9	54.1	52.0	53.8	53.9
15	Shoulder height	13	56.3	58.3	58.9	57.3	59.6	60.8	59.0	60.8	61.2
16	Stature (overall height)	14	66.8	69.0	69.6	67.9	70.3	71.6	69.5	71.2	71.6
38	Inter-wrist span	34	51.6	53.4	52.4	52.7	54.2	54.5	53.9	55.1	55.3
39	Inter-elbow span	35	36.7	38.1	37.8	37.8	38.7	39.0	38.7	39.2	39.4
40	Elbow-wrist length	36	9.9	10.2	9.9	10.0	10.3	10.4	10.2	10.6	10.5
44	Waist-waist over shoulder	40	35.1	35.7	37.4	35.8	37.2	38.4	37.4	38.9	38.0
Derived dimensions used in the R.A.E. pattern system											
57	Axilla height minus waist height	9-8	9.3	9.4	9.6	9.1	9.5	9.9	8.9	9.6	8.7
58	Waist height minus thigh pivot height	8-7	7.0	7.5	7.9	7.1	7.6	7.9	7.8	7.6	8.5
59	Thigh pivot height minus knee pivot height	7-4	15.1	15.5	15.4	15.5	16.0	16.0	15.6	16.2	16.1
60	Thigh pivot height minus ankle height	7-3	29.3	30.1	29.8	29.7	30.8	31.2	30.4	31.5	31.6
61	Waist height minus crotch height	8-5	9.3	10.0	10.5	9.8	10.5	10.7	10.7	10.8	11.0
No. of men in size group on which data are based:			12	26	9	28	48	19	24	19	3

Table 55  
DIMENSIONS OF THE NINE THEORETICAL "MEN" IN PRELIMINARY SIZE ROLL BASED ON CHEST/TORSO HOOP CONTROLS



Range of recorded subject measurements - inches									
Size No.	1	2	3	4	5	6	7	8	Min. range Max. range
Chest/torso hoop control									
Stature	65 -69.6	65.5-72.1	65.4-71.8	63.7-71.8	67.3-74.8	69.4-75.9	65.5-73.2	67 -76.8	4.6 9.8
Shoulder height	54.7-58.6	55.6-60.5	54.9-61.5	53.4-60.8	56.8-63.4	58.8-64.4	55.7-62.2	56.6-66.5	3.9 9.9
Crotch height	30.1-33.8	29.5-35	29.1-34.5	29 -34.9	30 -36.7	31.5-37.2	28.5-36.7	30 -38.2	3.7 8.2
Arm length	15.9-19	15.3-19.2	15.1-18	14.8-19.5	15.3-19.3	16.8-19.8	14.6-19.4	14.7-19.5	3.0 4.8
Chest	34.5-36.8	34 -36.9	34.9-36.7	37 -39.5	37 -39.9	37 -39.9	40 -42.9	40.5-42.4	1.8 2.9
Waist	28.3-32.8	27 -33.3	29 -32.6	28.7-34.4	29.2-37.5	29.5-36.1	29.8-39.8	32.3-38.3	3.6 10.0
Buttocks	35.4-37.3	34.3-39.1	35.5-39.4	36 -40.7	36.8-41.5	37.8-42	37.7-42.5	39.3-43	1.9 4.8
Torso hoop	59.2-61.3	61.5-63.9	64.3-65.9	60.3-62.9	63.4-65.8	66 -68.4	63.7-66.4	66.5-69.5	1.6 3.0
Weight (lb)	130 -145	126 -155	135 -166	138 -174	149 -188	154 -194	157 -200	175 -209	15 43
No. in group	12	26	9	28	48	19	24	19	
Chest/stature control									
Stature	64.2-66.5	67.2-69.9	70 -72.1	64.6-67.4	67.6-70.9	71 -74.2	66 -69.9	70.1-73.2	2.1 3.9
Shoulder height	53.7-56.1	56.4-59.3	59 -61.5	54.1-57.2	56.7-60.6	58.8-63.4	55.1-59.9	58.8-62.5	2.4 4.8
Crotch height	28.9-32.1	29.5-33.8	31.2-35	29.5-32	30 -34.9	31.5-36.7	28.8-32.8	31.8-36.7	2.5 5.2
Arm length	15.1-18	16.2-19.1	16.7-19.2	15.1-18.9	15.3-19.5	16.7-19.3	14.6-19.4	16.8-18.7	1.9 4.8
Chest	34.9-36.8	34 -36.9	34 -36.6	37 -39.5	37 -39.9	37 -39.9	40 -42.9	40 -42.5	1.9 2.9
Waist	27 -33.3	28.3-32.5	28 -32.6	30 -34.3	28.6-36.3	29.2-37.5	33.5-38.3	29.8-38.3	4.2 8.5
Buttocks	34.3-39	35.5-39.1	35.4-39.4	34.3-39.2	35.4-42	36.8-41.1	37.7-42.5	38 -43	3.6 6.6
Torso hoop	57.5-64.3	61.2-64.8	61.5-65.9	58.9-65.2	56.9-68.1	62.9-69	62.6-67.3	64.9-69.1	11.2 57
Weight (lb)	130 -144	132 -155	126 -166	128 -160	137 -194	150 -194	157 -194	170 -208	14
No. in group	13	21	14	12	56	27	18	22	
Weight/stature control									
Stature	63.7-65.7	66 -68.9	69.1-71.9	65.3-67.7	68 -71.4	71.5-74.8	67 -70.9	71 -74.3	2.0 3.9
Shoulder height	53.4-55.7	55.5-58.3	58.3-61.5	54.7-57.4	57.6-61.1	60.6-63.4	56.6-60.6	60 -63.6	2.3 4.0
Crotch height	28.9-32.1	29.5-33.4	31.2-35	28.8-32.2	30.8-34.5	32.3-36.7	30 -34.8	32.5-36.7	3.2 4.8
Arm length	14.8-16.9	15.8-19.1	16.2-19.2	14.6-18.9	15.3-19.5	16.8-19.3	14.7-18.1	16.8-18.7	1.9 4.3
Chest	34.9-38.6	34 -39.5	34 -38.6	37.4-43	36.3-41.1	37 -40.1	37.5-43.3	38.7-44.5	3.1 5.8
Waist	27 -34	28.6-34.3	28 -32.3	31.6-36.8	29 -36	29.8-35	32 -38.3	32.3-39.5	4.3 7.2
Buttocks	34.3-39	35.4-39.2	35.4-38.7	37.4-40	37.5-41.8	37.6-41	38.8-42.5	40.1-43	2.6 4.7
Torso hoop	57.5-64.3	56.9-64.4	60.7-65.7	60.7-66.3	61.1-68.1	62.9-69	64.2-67.8	64.5-69.1	3.6 7.5
Weight (lb)	128 -152	134 -154	126 -154	156 -175	155 -179	156 -178	180 -194	180 -204	14 28
No. in group	13	29	27	13	50	15	19	19	

Note: The arbitrary sizes to which this table refers are defined on Fig.4. Size 9 has been omitted as containing too few subjects to be usable.

Table 56  
THE EFFECT OF DIFFERENT PAIRS OF GARMENT SIZING CONTROL PARAMETERS ON THE  
RANGE OF SOME OF THE DEPENDENT SUBJECT MEASUREMENTS

Measurement	Table No.	Min.	Max.	Mean	S.D.	Coefficient of Variation
Age years	43a	19.7	45.9	28.730	5.960	2.07
Weight - lb	42	126.0	239.0	163.835	20.629	12.59
Chest girth - in	1	34.0	45.9	38.546	2.273	5.90
Torso hoop	2	56.9	73.2	64.440	2.606	4.04
Ankle - height of min dia	3	4.0	5.9	4.993	0.339	6.79
Knee pivot height	4	16.6	22.7	19.713	0.944	4.79
Crotch height	5	28.5	38.2	32.648	1.664	5.10
Wrist height	6	31.2	39.3	34.900	1.526	4.37
Thigh pivot height	7	31.1	41.8	35.455	1.664	4.69
Waist height	8	38.2	49.2	42.969	1.977	4.65
Axillary height	9	47.3	58.5	52.360	2.127	4.06
Suprasternal height	10	51.6	63.3	56.610	2.110	3.73
Neck root height	11	52.3	64.2	57.507	2.136	3.71
7th Cervical height	12	54.0	66.8	59.749	2.273	3.80
Shoulder height	13	53.4	66.5	59.001	2.278	3.86
Stature (height), seated	14	63.7	76.8	69.669	2.415	3.47
Knee height, standing	15	19.1	25.1	21.893	0.990	4.52
Thigh length	16	21.2	26.8	23.922	1.036	4.33
Heel/instep girth	17	11.5	14.6	12.968	0.551	4.25
Sitting height	18	33.8	39.5	36.481	1.198	3.28
Knee girth, fully flexed	19	15.0	19.5	16.985	0.847	4.99
Ankle girth, min.	20	7.7	10.5	8.883	0.495	5.57
Ankle girth, 2 1/4" above min.	21	8.0	11.2	9.664	0.613	6.34
Calf girth	22	12.4	16.5	14.422	0.895	6.21
Small (garter) girth	23	11.8	15.3	13.289	0.760	5.72
Knee girth, standing	24	13.3	18.1	15.224	0.802	5.27
Thigh girth	25	18.2	27.2	22.171	1.587	7.16
Buttock girth	26	34.3	46.2	38.848	2.029	5.22
Waist girth	27	27.0	41.5	32.955	2.707	8.21
Neck girth	28	13.1	17.3	15.034	0.689	4.58
Wrist girth, min.	29	6.1	8.1	6.933	0.365	5.26
Wrist girth, 2 1/4" above min.	30	6.7	9.4	8.018	0.497	6.20
Elbow girth, fully flexed	31	12.0	15.8	13.847	0.696	5.03
Biceps girth, relaxed	32	9.3	14.0	11.468	0.922	8.04
Biceps girth, flexed	33	9.9	15.6	12.688	1.002	7.90
Interwrist span	34	48.0	60.4	53.761	2.274	4.23
Interelbow span	35	34.6	42.8	38.416	1.593	4.15
Forearm Length	36	8.9	12.0	10.223	0.496	4.85
Arm length, shoulder - finger tip	37	29.6	39.7	33.421	1.614	4.83
Shoulder breadth	38	15.6	19.8	17.746	0.833	4.69
Waist-waist, under crotch	39	23.3	34.3	27.890	1.739	6.24
Waist-waist, over shoulder	40	33.1	42.7	37.104	1.643	4.44
Shoe size	43b	6.0	12.0	8.537	1.221	14.30
Head girth	41	21.1	24.2	22.810	0.550	2.41
Knee top-knee pivot (15-4)	44a	1.4	3.3	2.179	0.313	14.36
Torso length (13-5)	44b	23.2	29.8	26.353	1.150	4.36
Arm length (9-6)	45a	14.6	20.5	17.459	1.012	5.80
Thigh pivot - crotch (7-5)	45b	0.5	5.1	2.807	0.665	23.69
Top of head - shoulder (14-13)	46a	9.6	12.4	10.668	0.510	4.78
Ankle taper (21-20)	46b	0.1	1.8	0.781	0.291	37.26
Wrist taper (30-29)	47a	0.4	1.9	1.085	0.275	25.34
Axilla-waist (9-8)	47b	7.3	11.4	9.391	0.815	8.68
Waist - thigh pivot (8-7)	48a	5.4	9.6	7.513	0.762	10.14
Thigh pivot - knee pivot (7-4)	48b	13.3	19.6	15.742	0.919	5.83
Thigh pivot - Ankle min. dia. (7-3)	49a	26.4	36.1	30.462	1.543	5.07
Waist - crotch (8-5)	49b	8.1	12.5	10.320	0.900	8.72
Axilla - crotch (9-5)	50	16.4	22.2	19.710	1.040	5.28

Table 57

SUMMARY OF STATISTICAL DATA ON FULL SAMPLE (INCH UNITS)



Measure	Survey of 550 British aircrew - December 1944 (see Ref.3)				R.A.E. survey of 200 British aircrew October/November 1966 (this Report refers)				Differences in means of 1944 and 1966 surveys					
	No. of men	Average and S.E.	Standard deviation and S.E.	Range	No. of men	Average and S.E.	Standard deviation and S.E.	Range	Difference		S.E. of difference		Difference S.E. of difference	
									Means	S.D.	Means	S.D.		
Age	520	23.2 (0.14)	3.26(0.10)	19 -35	200	28.73(0.422)	5.96 (0.298)	19.7-45.9	5.530	2.700	0.44502	0.31468	12.426	8.580
Height (stature)	529	68.50(0.103)	2.37(0.073)	62 -75	200	69.67(0.171)	2.415(0.121)	63.7-76.8	1.170	0.045	0.19945	0.14103	5.866	0.319
Arm reach	529	33.61(0.065)	1.50(0.046)	28.5-38.0	200	33.42(0.114)	1.614(0.081)	29.6-39.7	0.190	0.114	0.13145	0.09295	1.445	1.227
Sitting height	529	36.16(0.054)	1.24(0.038)	32.0-39.5	200	36.48(0.085)	1.198(0.060)	33.8-39.5	0.320	0.042	0.10041	0.07100	3.187	0.592
Thigh length	529	23.32(0.045)	1.03(0.032)	20.5-26.5	200	23.92(0.073)	1.036(0.052)	21.2-26.8	0.600	0.006	0.08586	0.06071	6.988	0.099
Shoulder breadth	529	16.79(0.030)	0.69(0.021)	14.5-19.0	200	17.75(0.059)	0.833(0.042)	15.6-19.8	0.960	0.143	0.06610	0.04674	14.523	3.059
Weight (lb)	529	144.9 (0.69)	15.9 (0.49)	106 -205	200	163.84(1.459)	20.629(1.031)	126 -239	18.940	4.729	1.61421	1.14142	11.733	4.143
Chest girth	529	34.89(0.079)	1.81(0.056)	30.0-42.5	200	38.55(0.161)	2.273(0.114)	34.0-45.9	3.660	0.463	0.17896	0.12654	20.452	3.659
Waist girth	529	28.82(0.079)	1.81(0.056)	24.5-38.0	200	32.96(0.191)	2.707(0.135)	27.0-41.5	4.140	0.897	0.20696	0.14623	20.004	6.129
Thigh girth	528	20.43(0.056)	1.29(0.040)	16.5-25.0	200	22.17(0.112)	1.587(0.079)	18.2-27.2	1.740	0.297	0.12548	0.08873	13.867	3.347
Neck girth	529	14.44(0.027)	0.61(0.019)	12.75-16.5	200	15.03(0.049)	0.689(0.034)	13.1-17.3	0.590	0.079	0.05547	0.03922	10.636	2.014
Calf girth	529	14.36(0.037)	0.85(0.026)	11.75-17.0	200	14.42(0.063)	0.895(0.045)	12.4-16.5	0.060	0.045	0.07329	0.05182	0.819	0.868
Small girth	529	12.61(0.029)	0.67(0.021)	10.5-15.0	200	13.29(0.054)	0.760(0.038)	11.8-15.3	0.680	0.090	0.06113	0.04322	11.124	2.082
Wrist girth	375	6.68(0.019)	0.36(0.013)	5.5-7.75	200	6.93(0.026)	0.365(0.018)	6.1-8.1	0.250	0.005	0.03181	0.02249	7.860	0.222
Buttock girth	529	36.28(0.070)	1.61(0.049)	32.0-41.5	200	38.85(0.143)	2.029(0.101)	34.3-46.2	2.570	0.419	0.15964	0.11288	16.099	3.712

The measures listed in this table were the only ones taken in the same manner in both surveys.

Table 58

COMPARISON OF ANTHROPOMETRIC DATA ON BRITISH MILITARY AIRCREW - SURVEYS 1944 AND 1966

REFERENCES

<u>No.</u>	<u>Author</u>	<u>Title, etc.</u>
1	R. E. Simpson C. B. Bolton	Some proposals for aircrew functional clothing. R.A.E. Technical Memorandum ME 316 (1965)
2	R. E. Simpson C. B. Bolton	The application of engineering techniques to body measurement and pattern drafting for aircrew functional clothing. R.A.E. Technical Report 66242 (1966)
3	Dr. G. M. Morant Sqn. Ldr. J. C. Gilson	Report on a survey of body and clothing measurements of Royal Air Force personnel. F.P.R.C. 663(a) (1945)
4	H. T. E. Hertzberg G. S. Daniels	Anthropometry of flying personnel 1950. WADC Technical Report 52-321



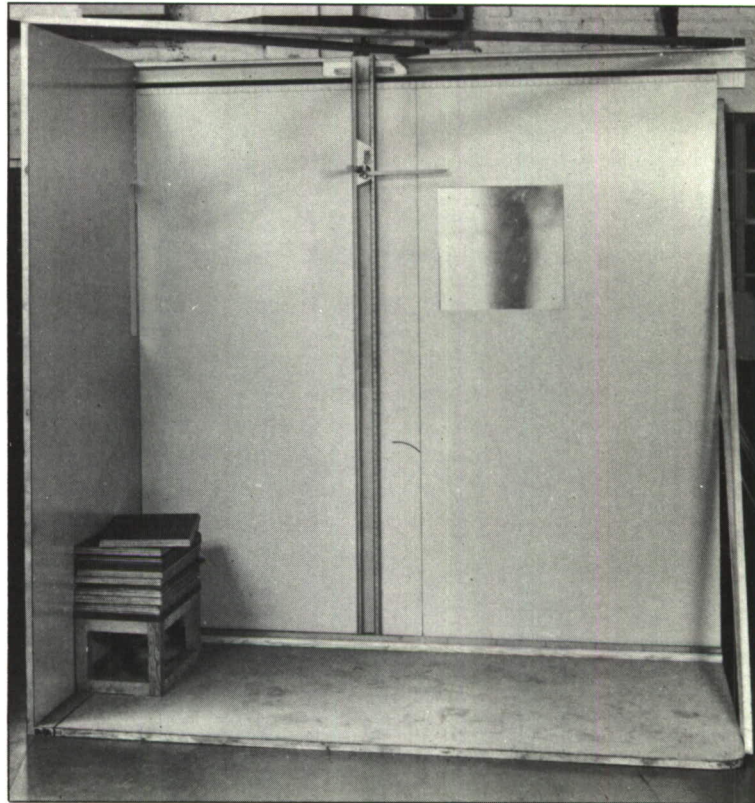


Fig.1a R.A.E. anthropometric rig

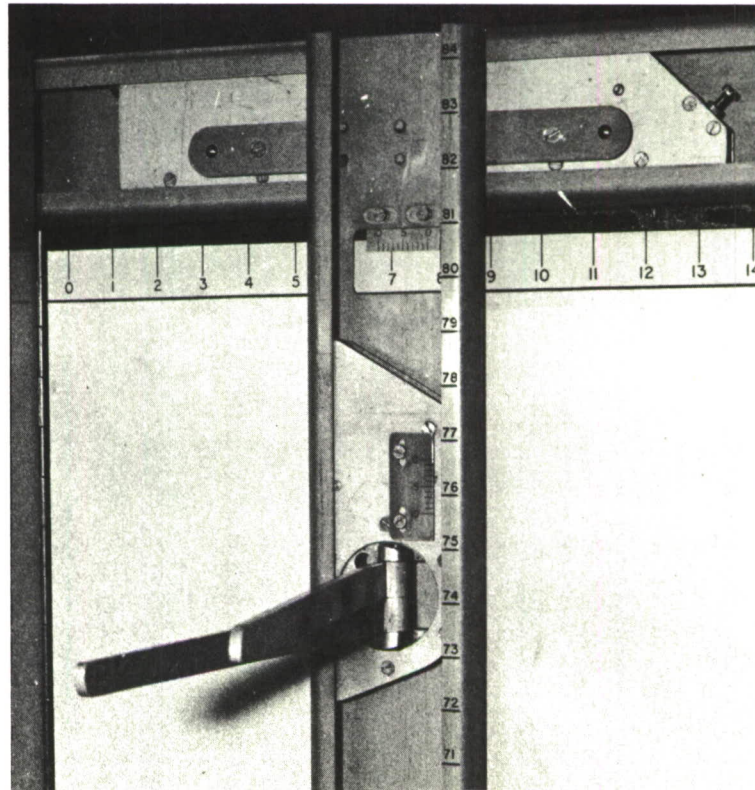


Fig.1b Close-up of measuring head and scales

Measured by: C.B.B.

Ser. No.: 126

Subject: Flt. Lt. A. B. Seedy

Age: 29

wt. lb: 154

Station: 957 Sqn. R.A.F. S. Tottering

A/C Cat. A.E.O.

Size	Body measure	Size	Body measure
36·1	Chest girth at nipples	10·4	Ankle girth 2½ inches up
64·3	Torso hoop, (L)	14·7	Calf girth
64·2	Torso hoop, (R)	13·6	Small girth (garter)
64·3	Torso hoop, av.	15·1	Knee girth, standing
04·6	Ankle height (least circ.)	21·9	Thigh girth, max.
18·6	Knee pivot height	37·5	Buttock girth
30·8	Crotch height	30·4	Waist girth
34·3	Wrist height	36·1	Chest girth at nipples
33·7	Thigh pivot height	14·7	Neck girth
41·8	Waist height	07·0	Wrist girth
50·5	Axillary height	08·4	Wrist girth, 2½ inches up
55·0	Suprasternal height	13·9	Elbow girth, full flex
55·9	Neck root height	11·8	Biceps, extended
58·3	Seventh cervical height	13·1	Biceps, contracted
57·3	Shoulder height, ¾ inches out	50·8	Inter-wrist span
68·5	Height	37·3	Inter-elbow span
20·8	Knee height – sitting	09·6	Elbow to wrist length
22·8	Thigh length (Morant)	31·6	Arm length (Morant)
13·0	Heel girth	17·4	Shoulder breadth
52·2	Height – seated	29·4	Waist-waist through crotch
15·7	Chair height	35·7	Waist-waist over shoulder
36·5	Sitting height	08·0	Shoe size
16·3	Knee girth, full flex	22·7	Head girth
09·3	Ankle girth – min.		

Fig.2 Data recording proforma



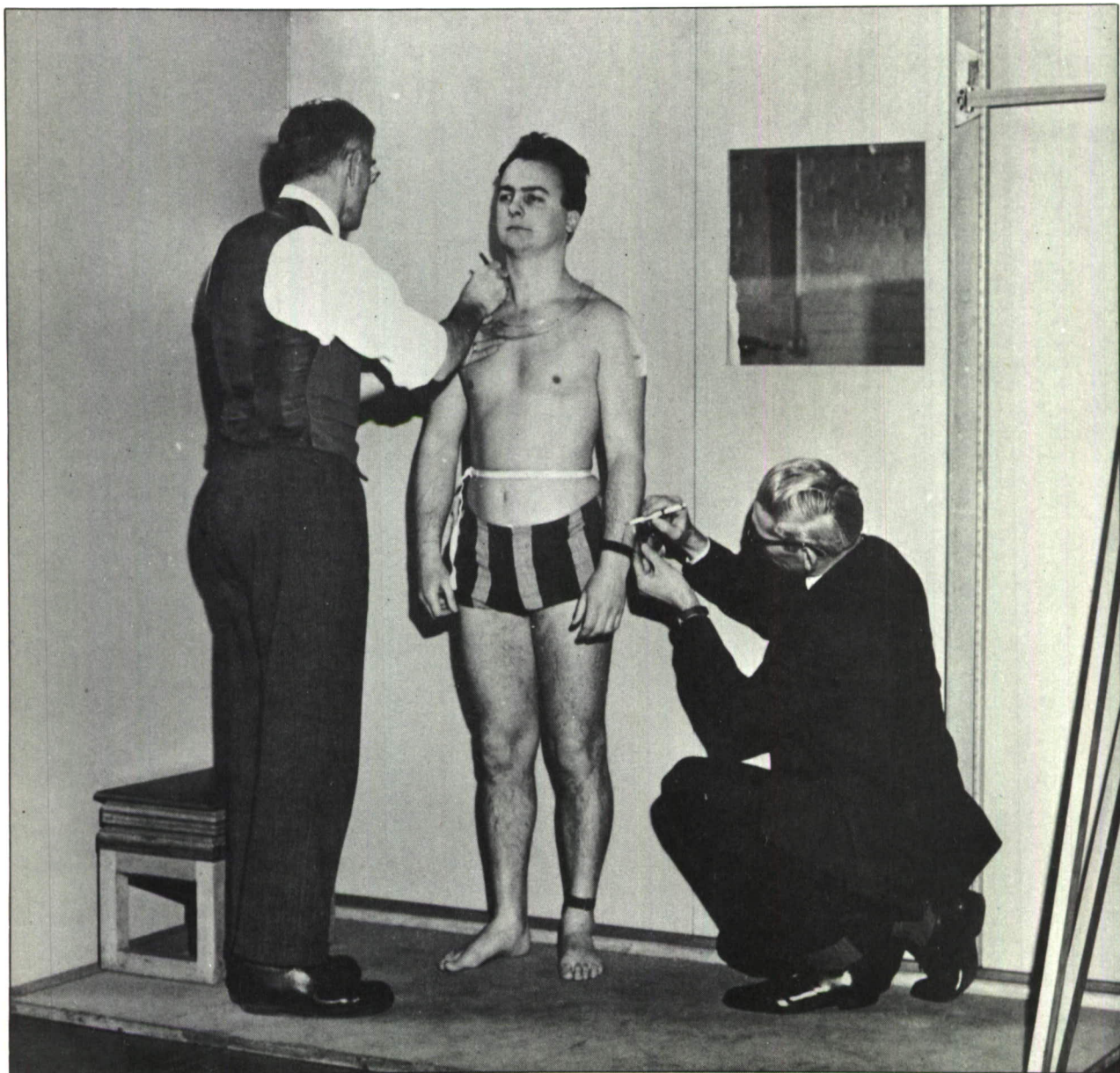


Fig.3 Location and marking of datum points on a subject

Fig. 4a

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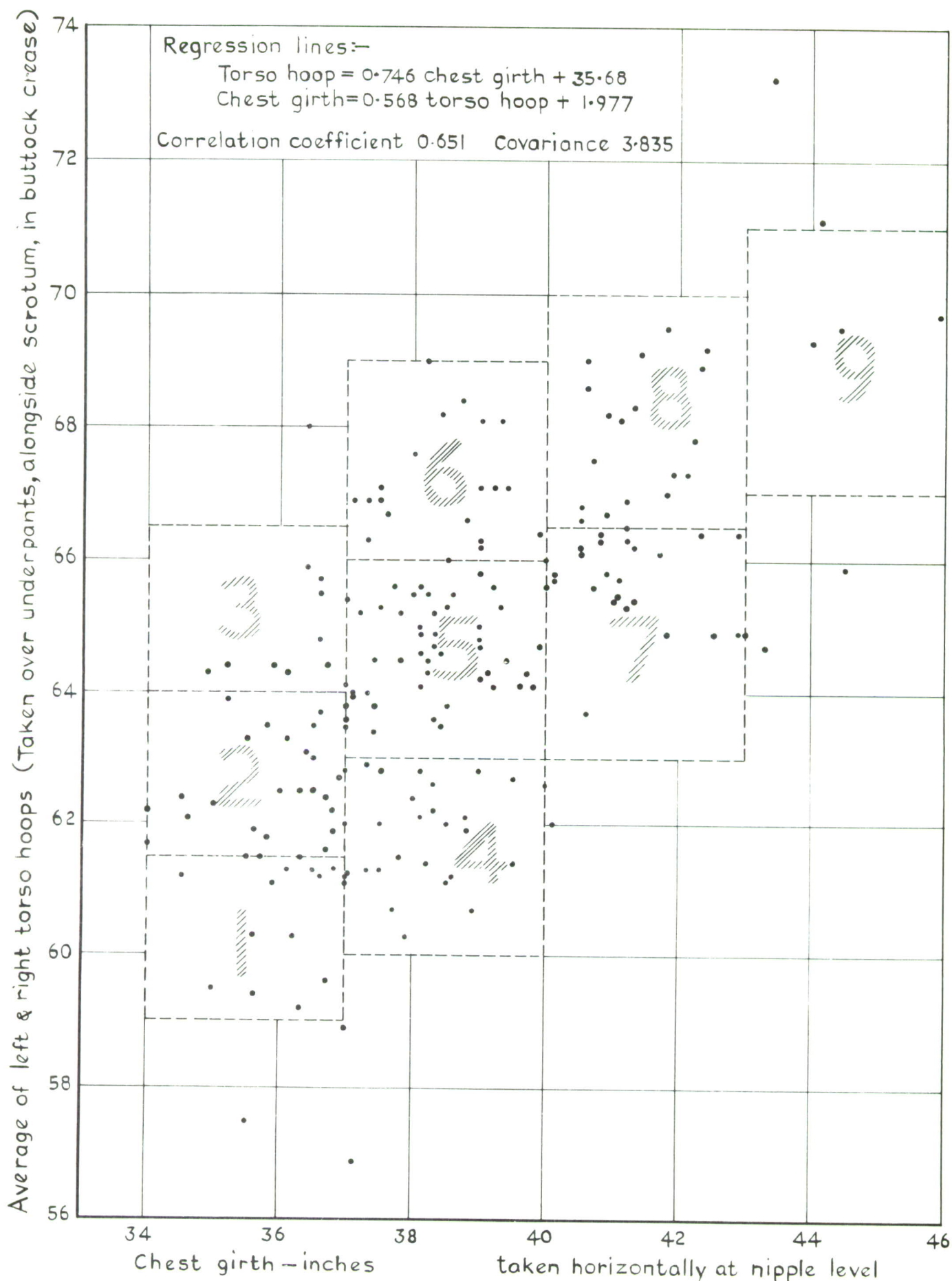


Fig. 4a Chest girth / torso hoop  
 Specimen 9 size roll grid superimposed



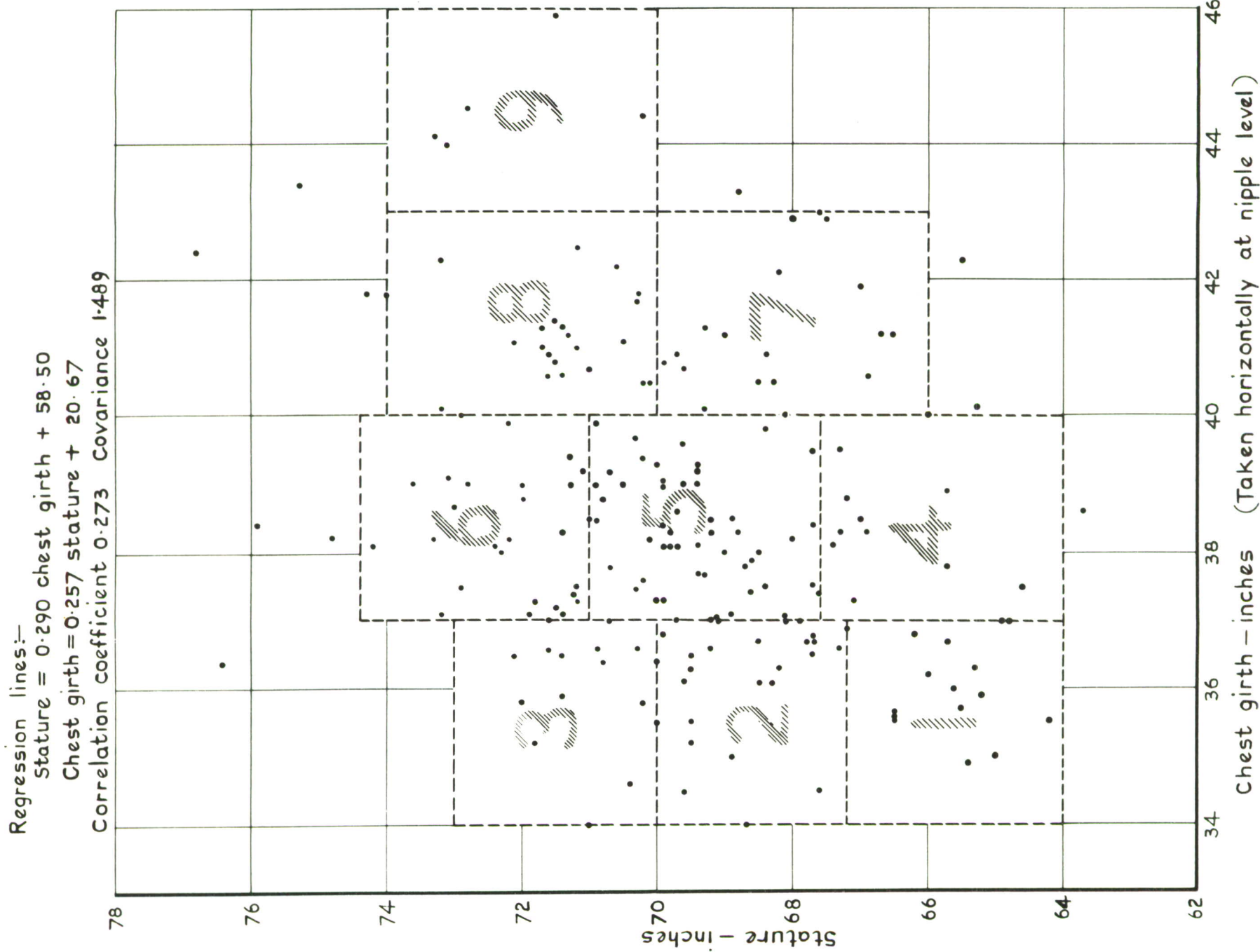


Fig.4b Chest girth /stature  
Specimen 9 size roll grid superimposed

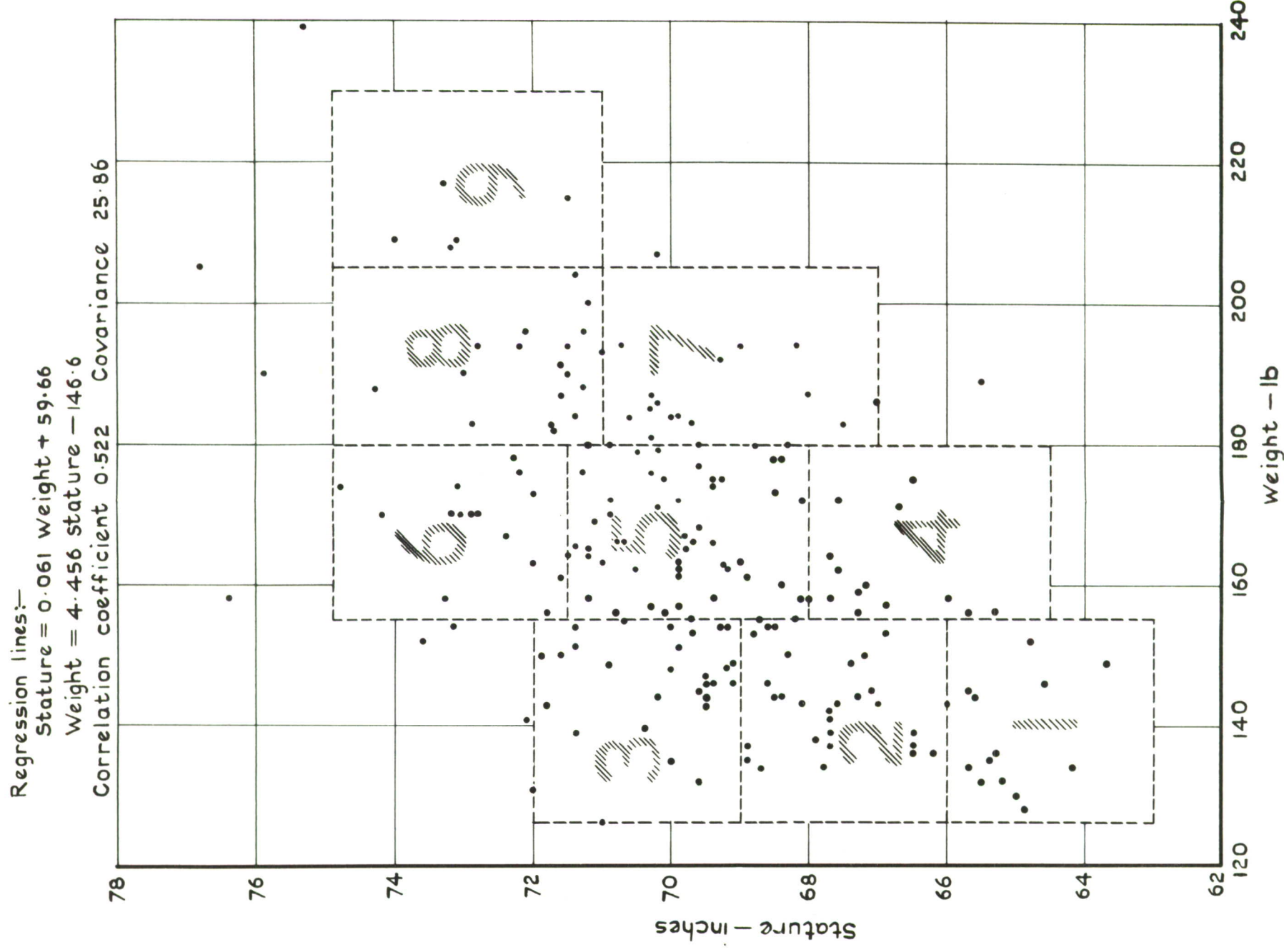


Fig.4c Weight/stature  
Specimen 9 size roll grid superimposed

Fig. 5

022 903274

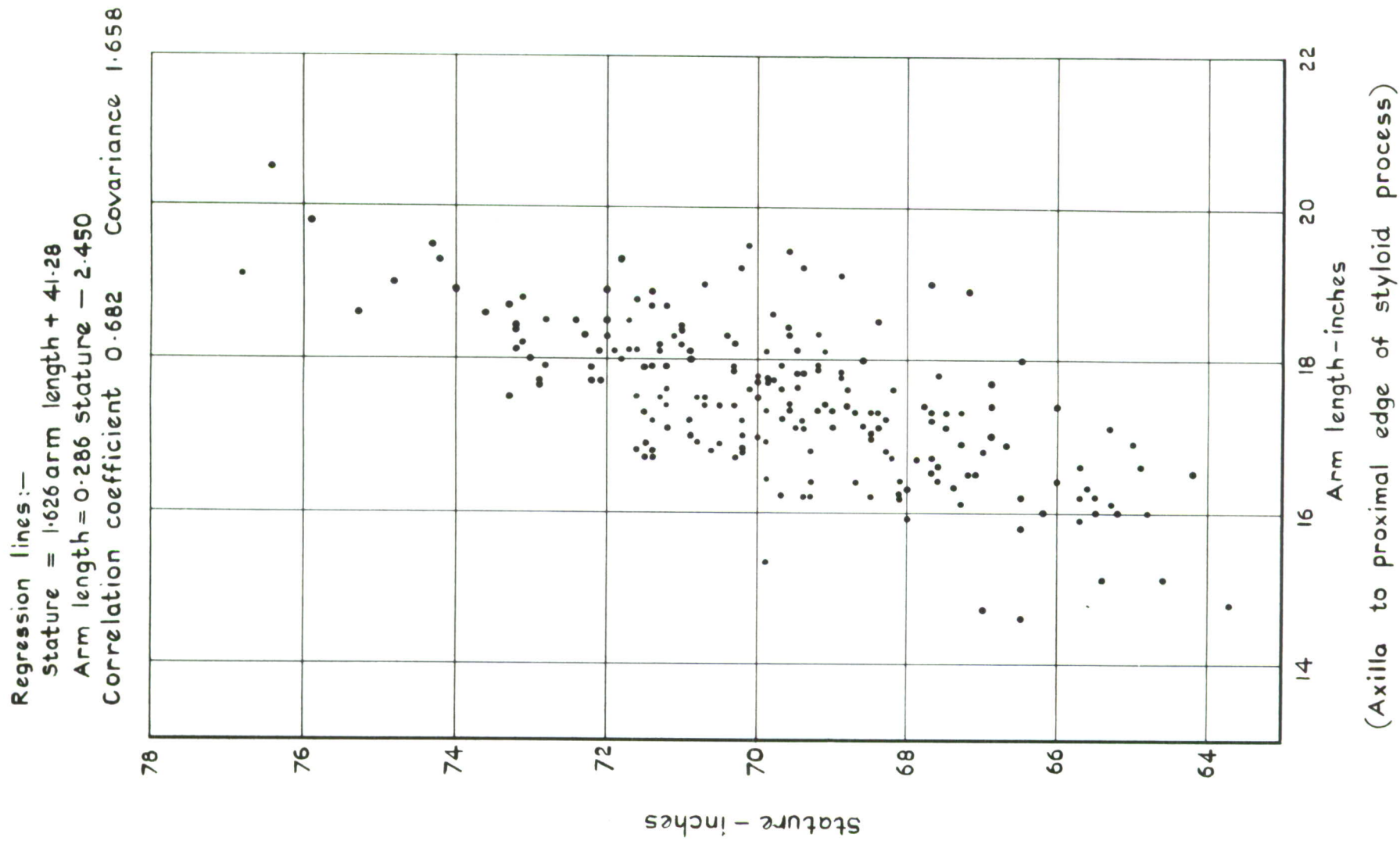


Fig. 5 Stature / arm length



Regression lines:—

$$\text{Stature} = 1.259 \text{ leg length} + 28.55$$

$$\text{Leg length} = 0.598 \text{ stature} - 9.024$$

Correlation coefficient 0.868      Covariance 3.471

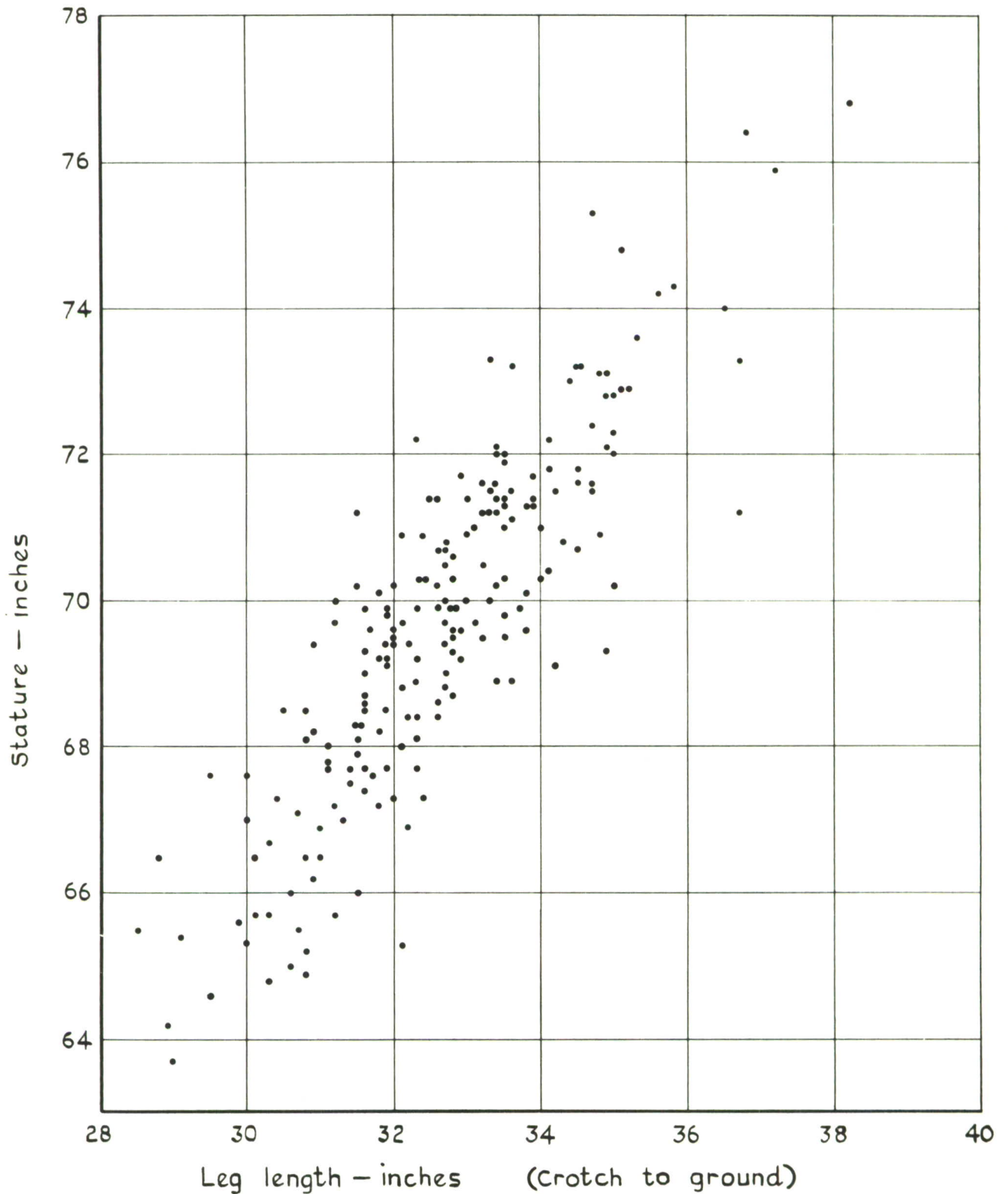


Fig.6 Stature / leg length

Fig.7

022 903276

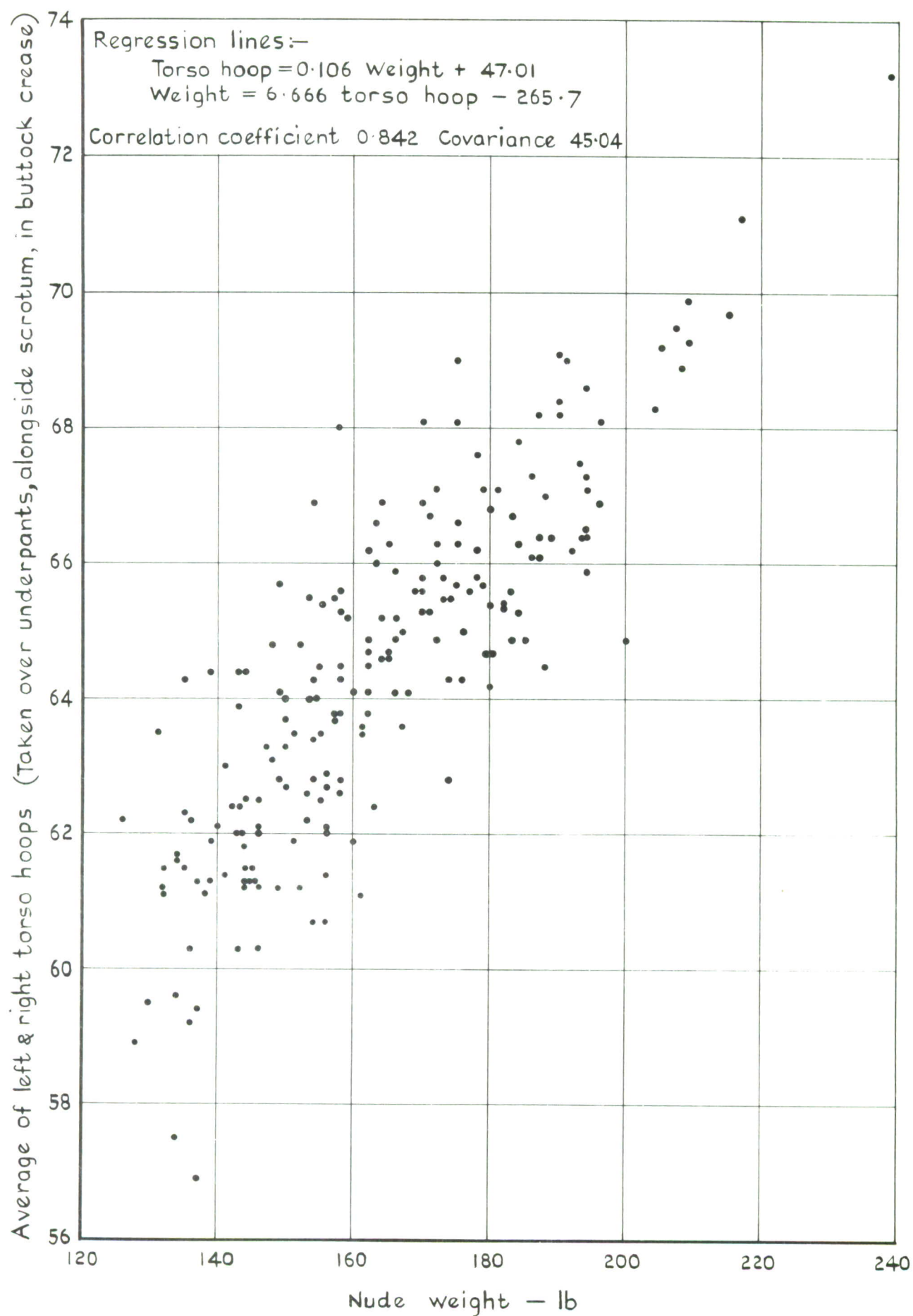


Fig. 7 Average torso hoop/nude weight



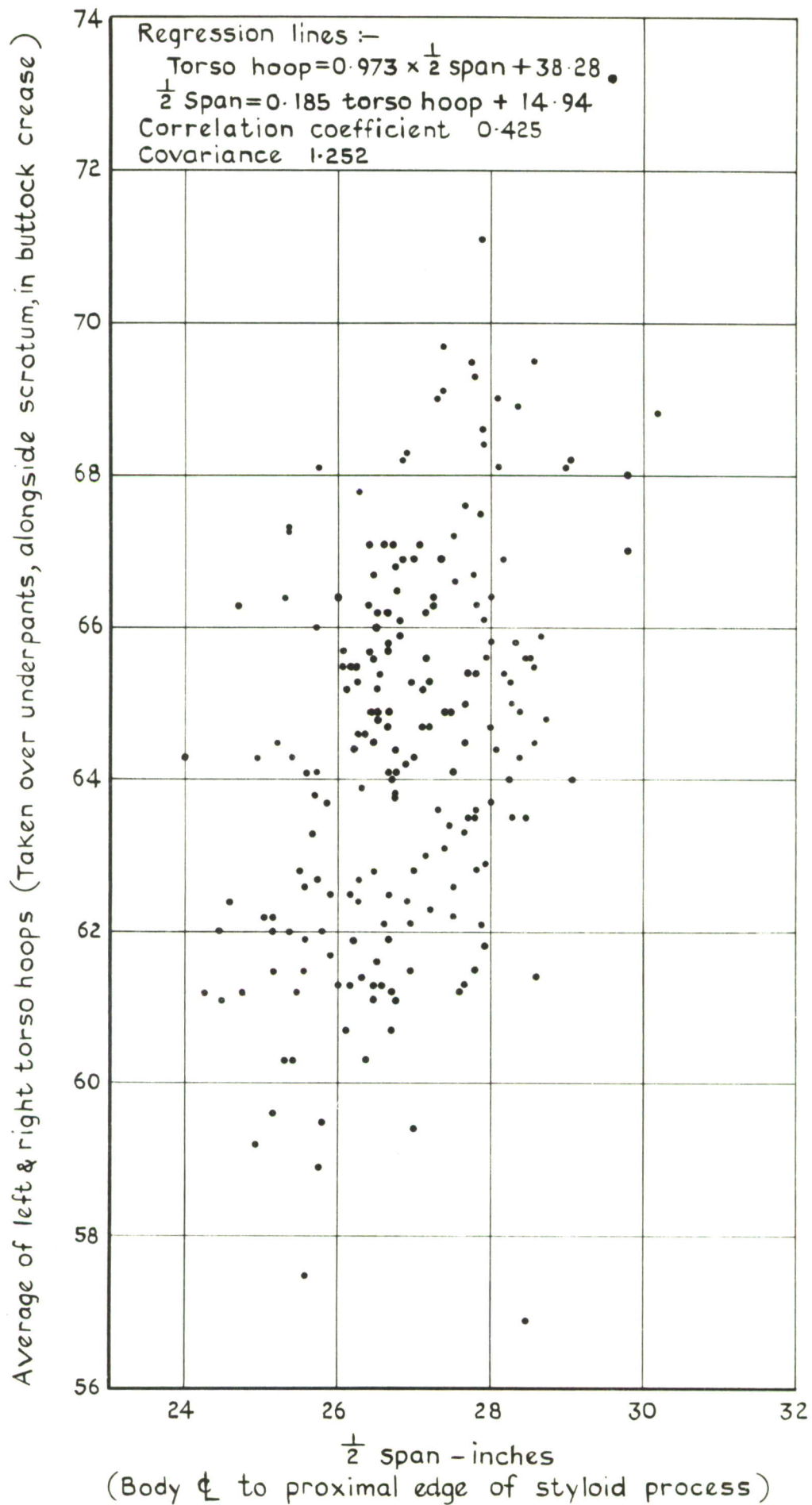


Fig.8 Average torso hoop/ half wrist span

Fig.9

022 903278

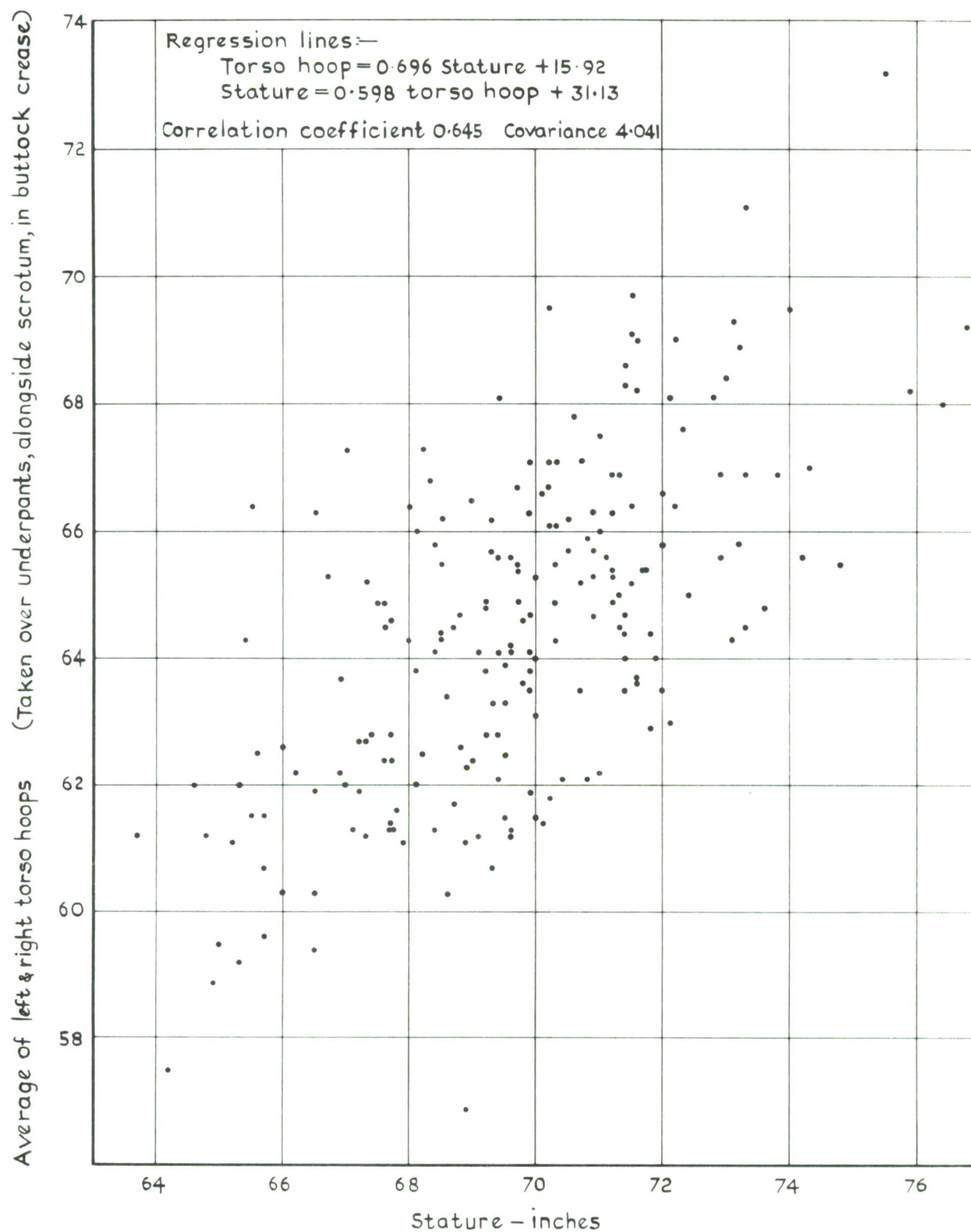


Fig. 9 Average torso hoop / stature



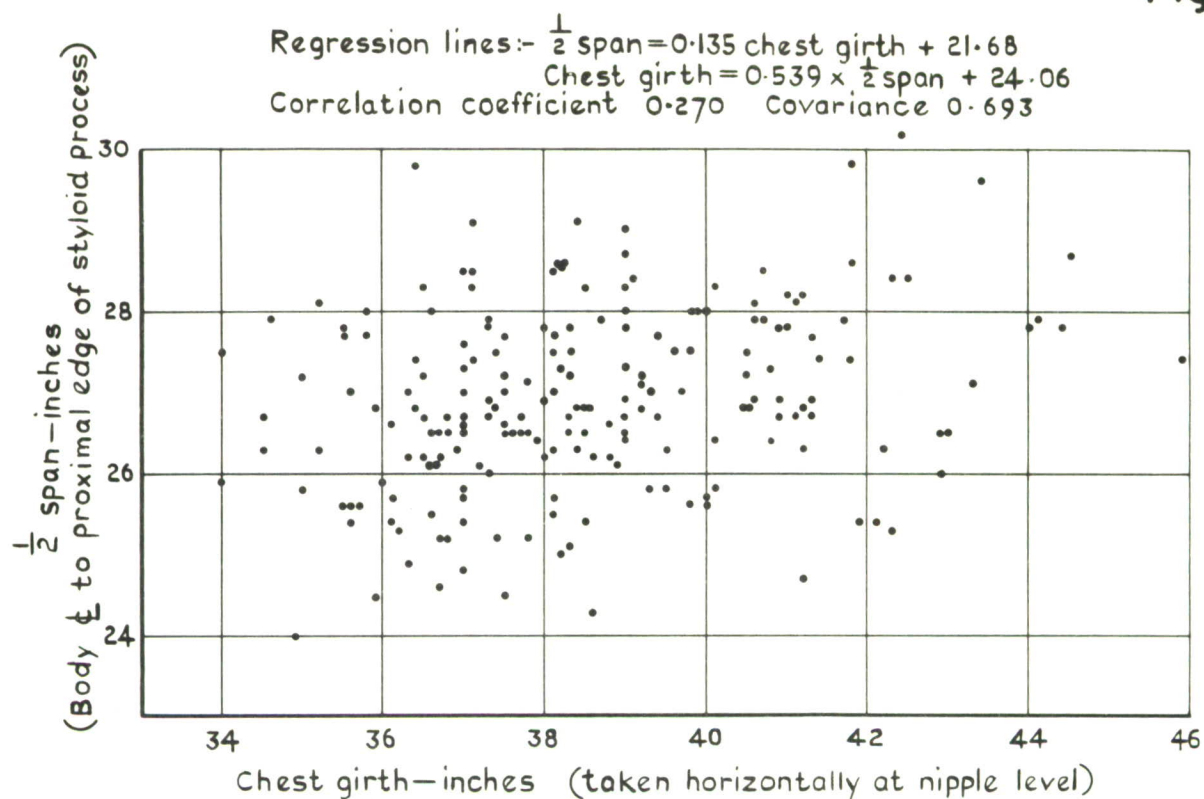


Fig.10 Chest girth / half wrist span

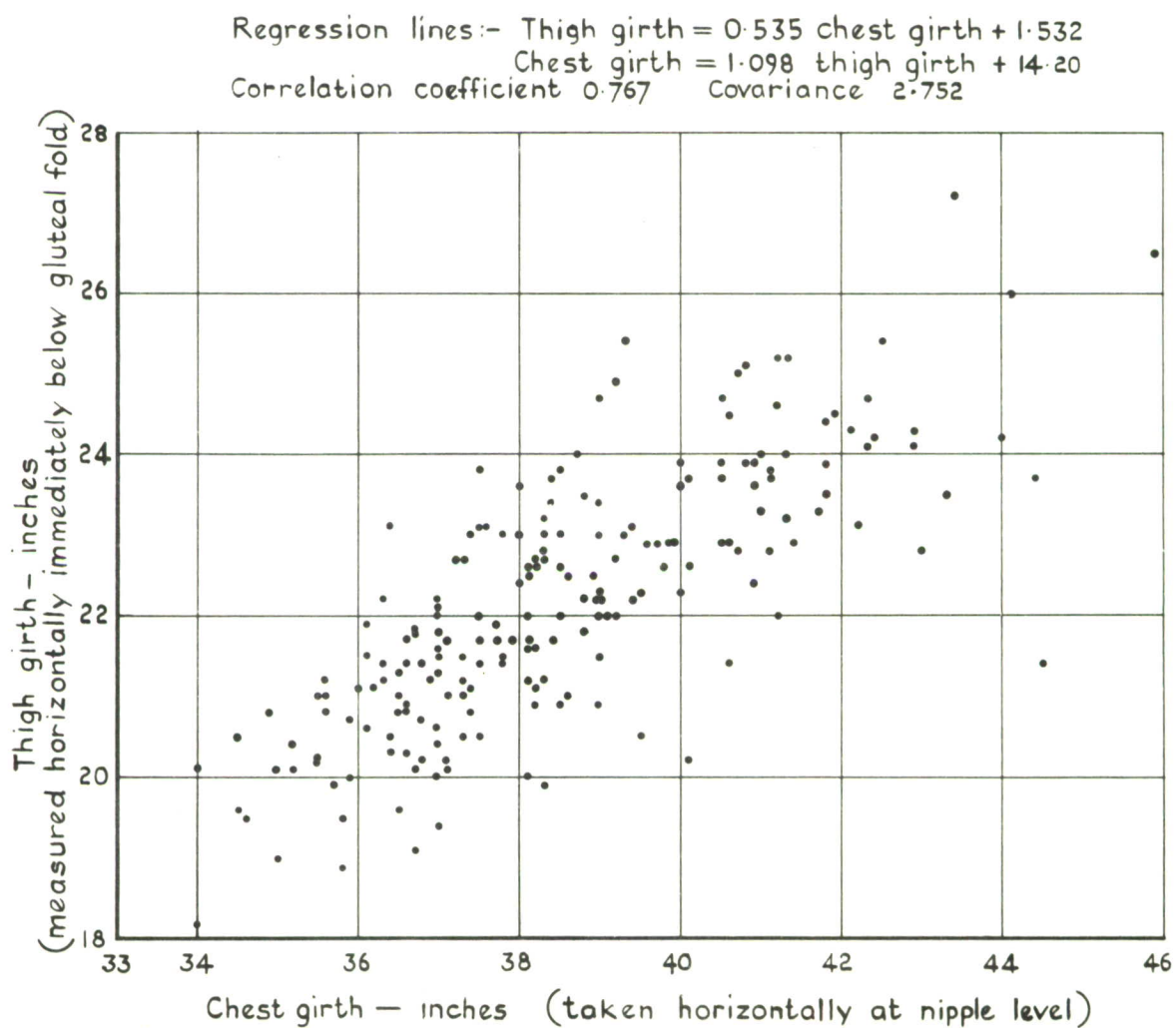


Fig.11 Chest girth / thigh girth

Regression lines:- Thigh length =  $0.450$  sitting height +  $7.495$

Sitting height =  $0.603$  thigh length +  $22.06$

Correlation coefficient  $0.521$  Covariance  $0.643$

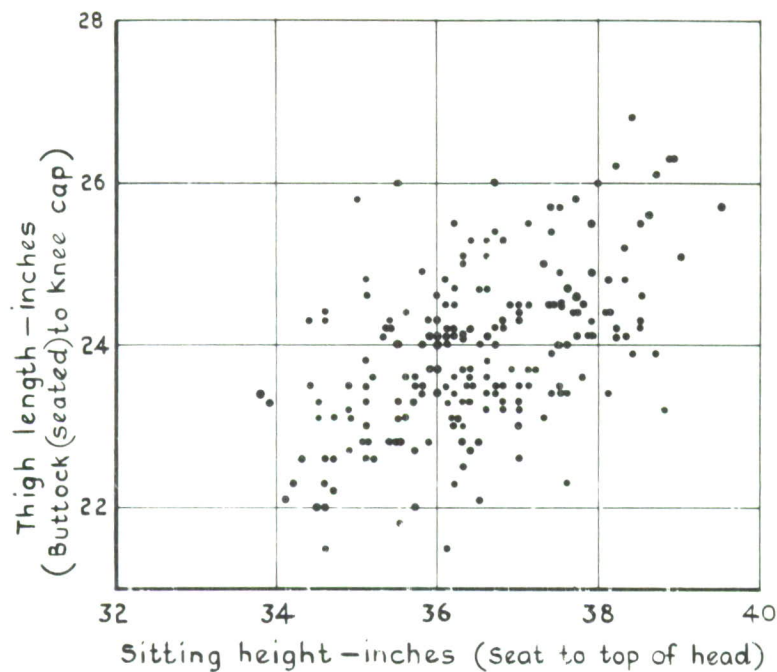


Fig.12 Sitting height / thigh length

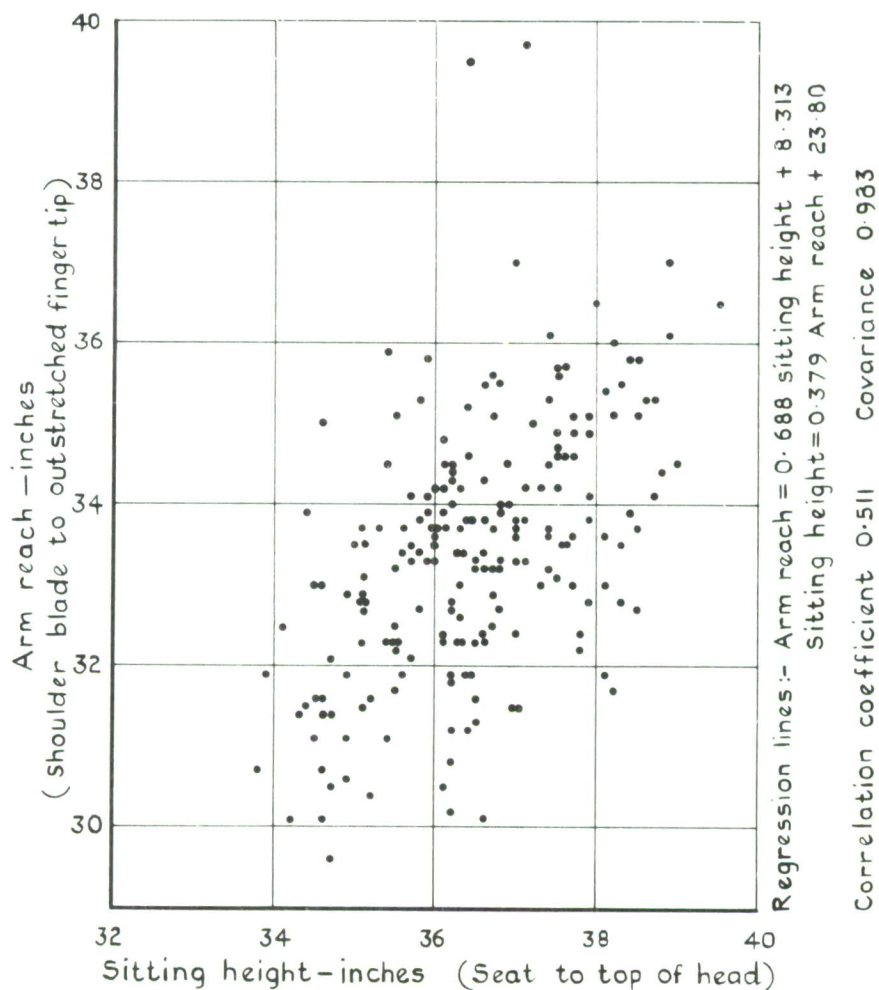


Fig.13 Sitting height / arm reach



Regression lines :-

$$\text{Leg length} = 1.127 \text{ Arm length} + 12.96$$

$$\text{Arm length} = 0.417 \text{ leg length} + 3.837$$

Correlation coefficient 0.686 Covariance 1.150

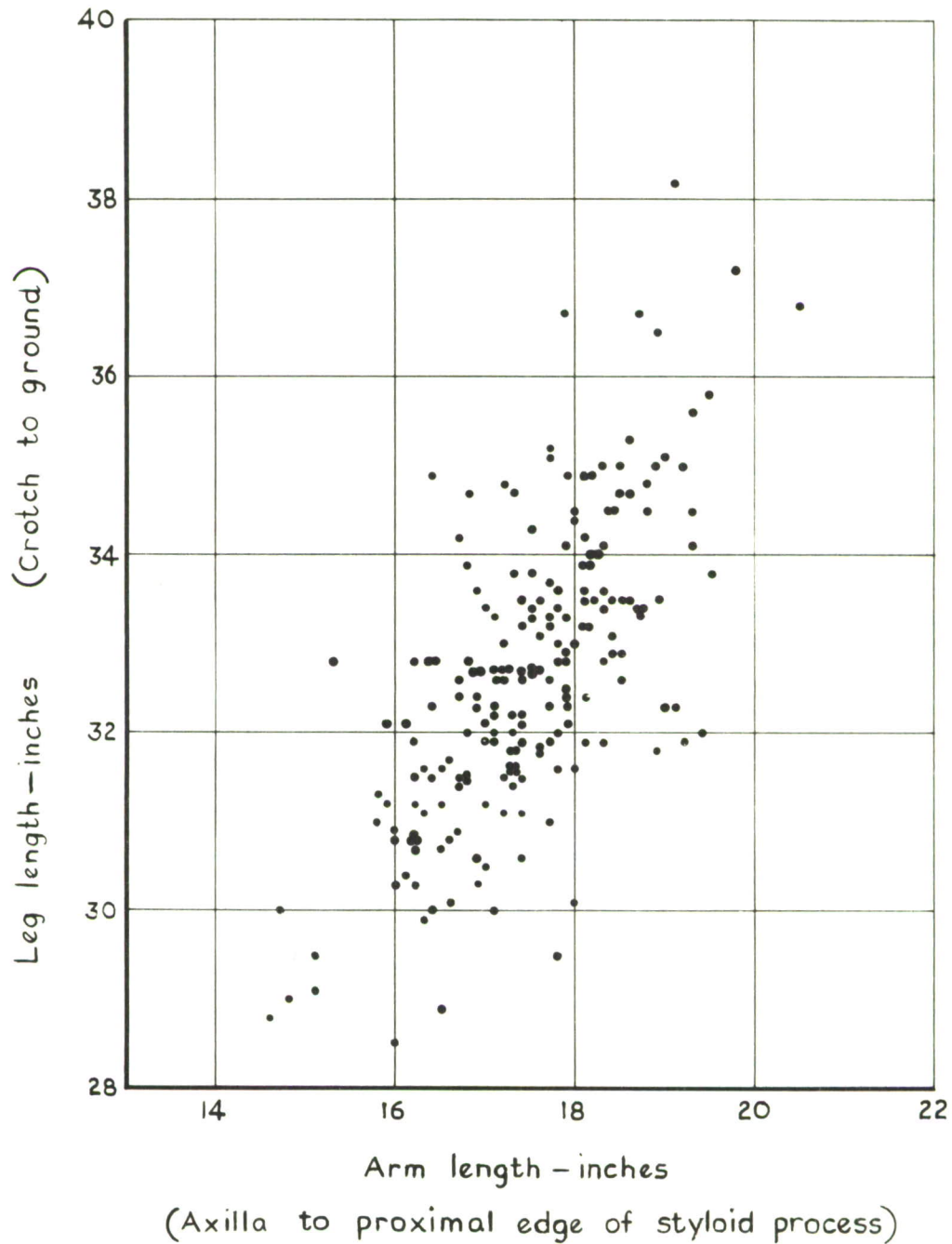


Fig.14 Leg length / arm length

Regression lines :-

$$\text{Stature} = 1.623 \text{ sitting height} + 10.46$$

$$\text{Sitting height} = 0.400 \text{ stature} + 8.638$$

Correlation coefficient 0.805    Covariance 2.319

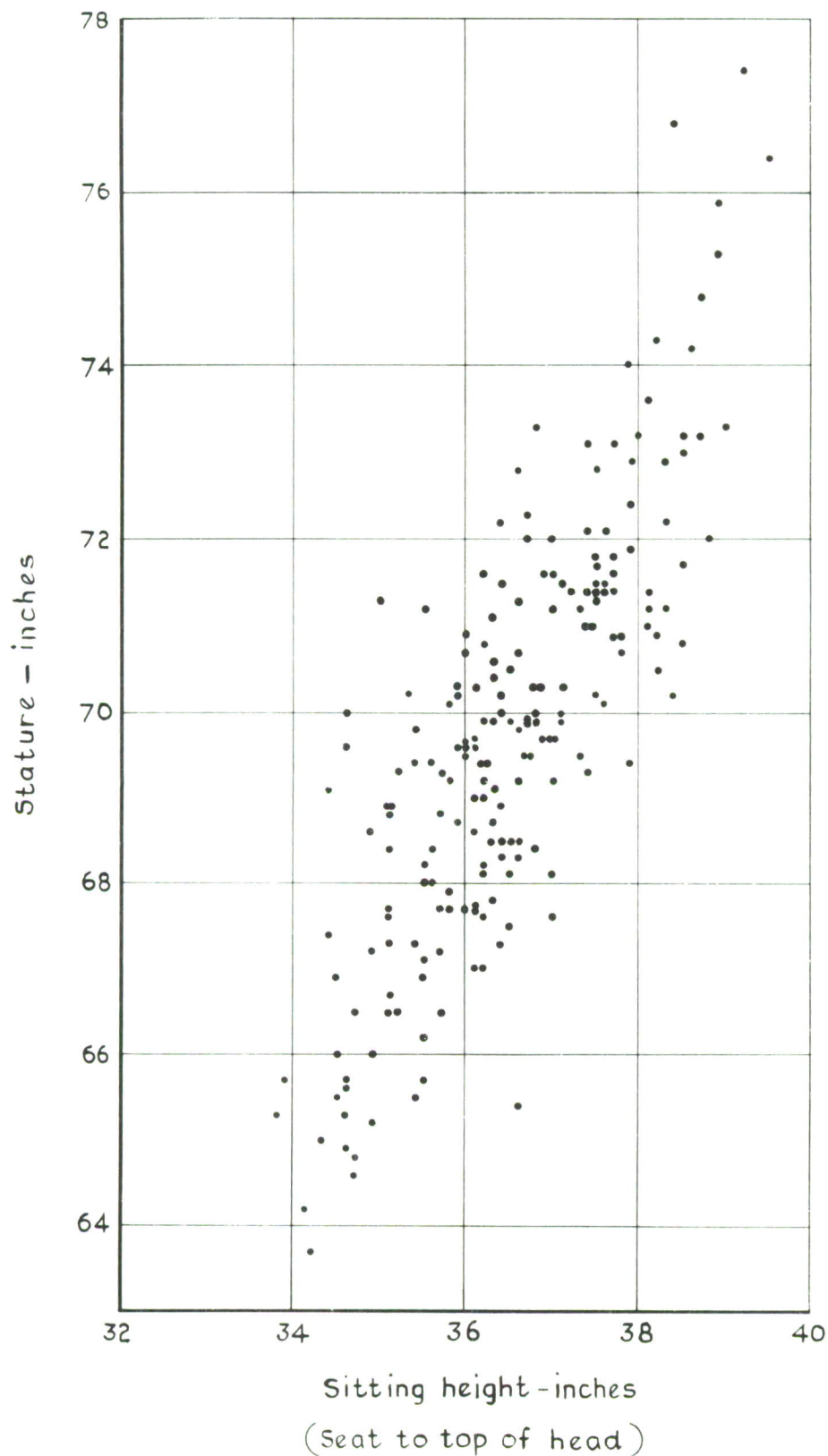


Fig.15 Stature/sitting height



Regression lines:-

$$\text{Torso length} = 0.198 \text{ leg length} + 19.89$$

$$\text{Leg length} = 0.414 \text{ torso length} + 21.72$$

Correlation coefficient 0.286    Covariance 0.546

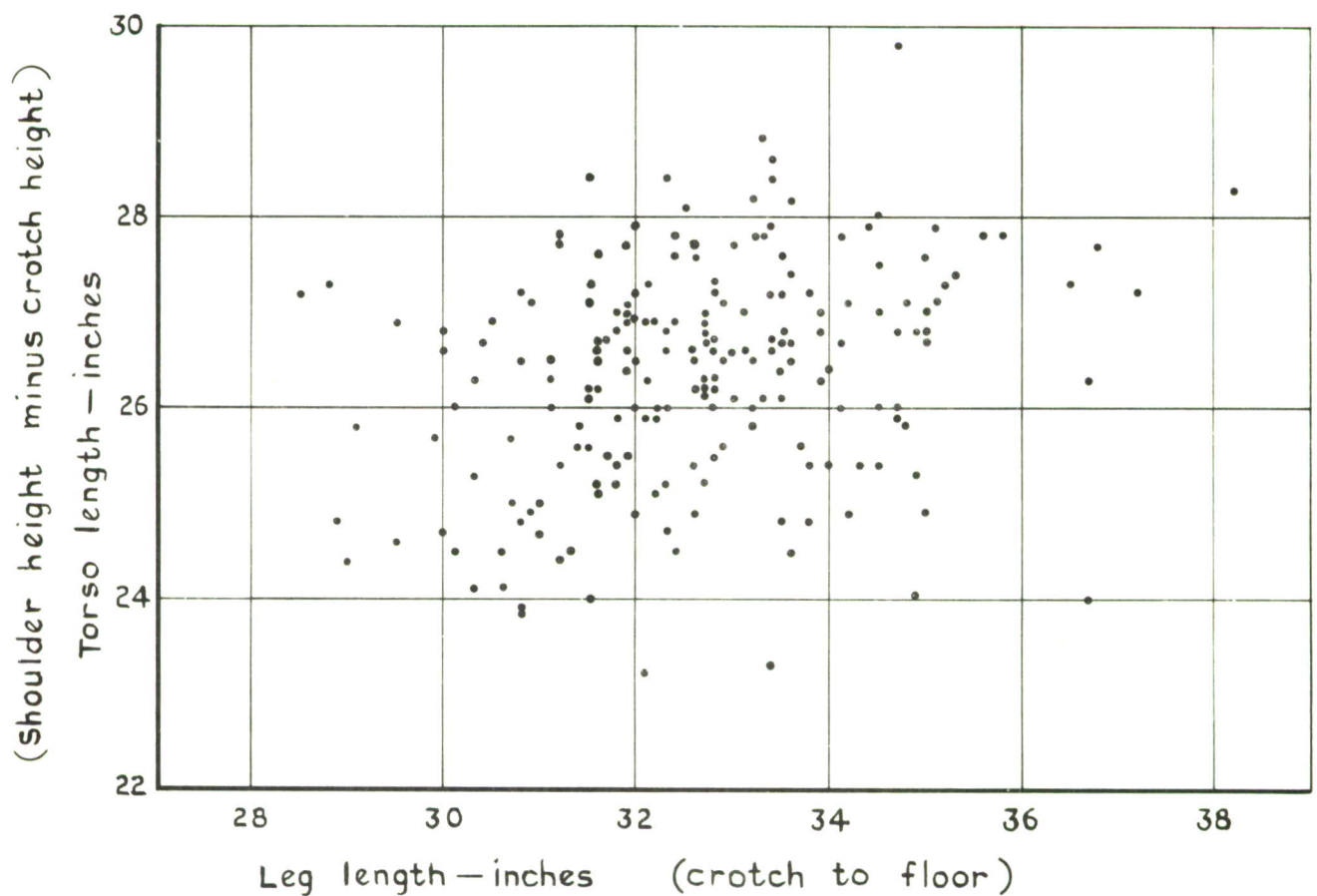


Fig.16 Leg length / torso length

Fig.17

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Regression lines:—

$$\text{Waist girth} = 1.012 \text{ chest girth} - 6.068$$

$$\text{Chest girth} = 0.714 \text{ waist girth} + 15.03$$

Correlation coefficient 0.850

Covariance 5.203

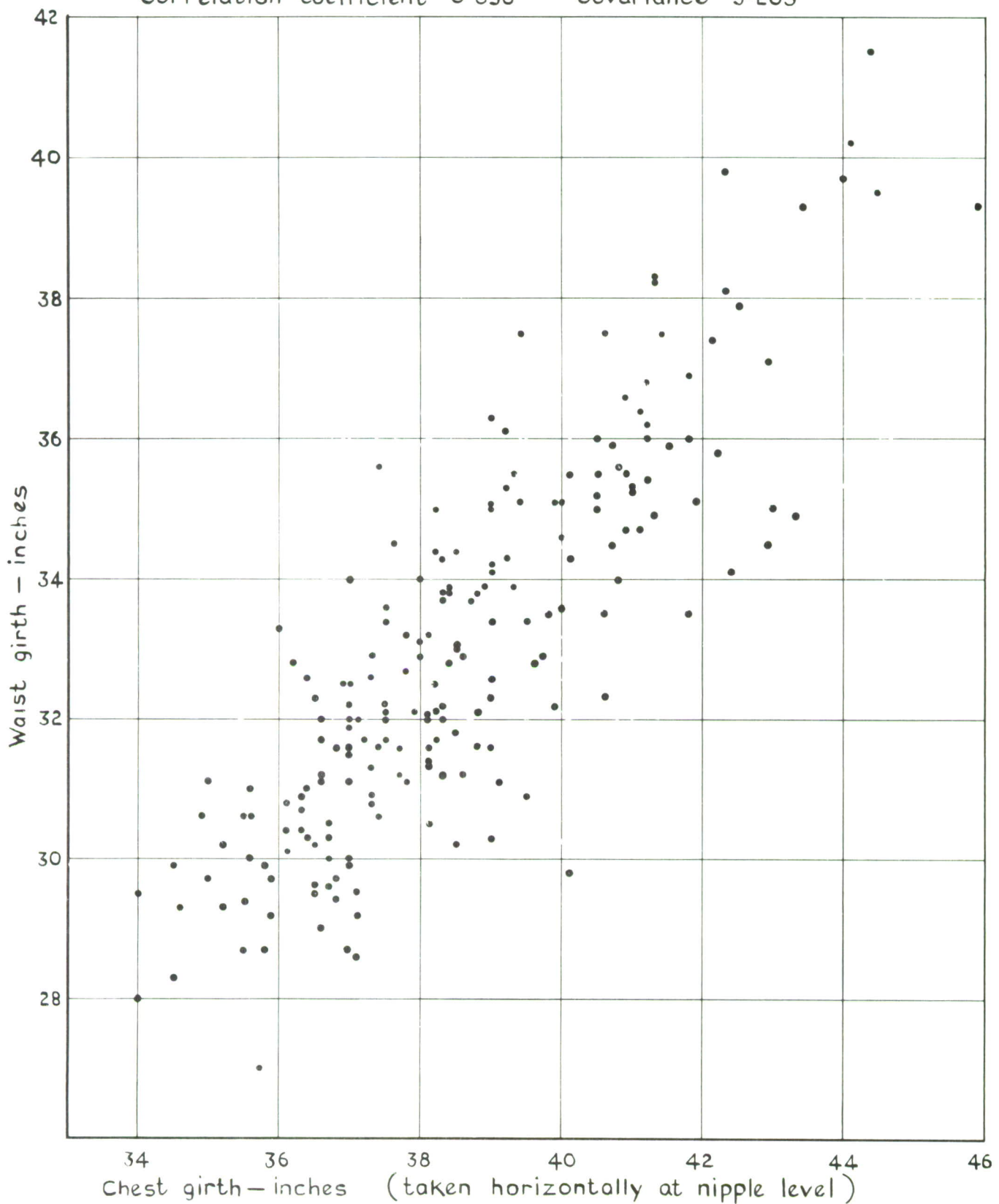


Fig.17 Chest girth / waist girth



Regression lines —

$$\text{Buttock girth} = 0.719 \text{ chest girth} + 11.13$$

$$\text{Chest girth} = 0.903 \text{ buttock girth} + 3.481$$

Correlation coefficient 0.806      Covariance 3.696

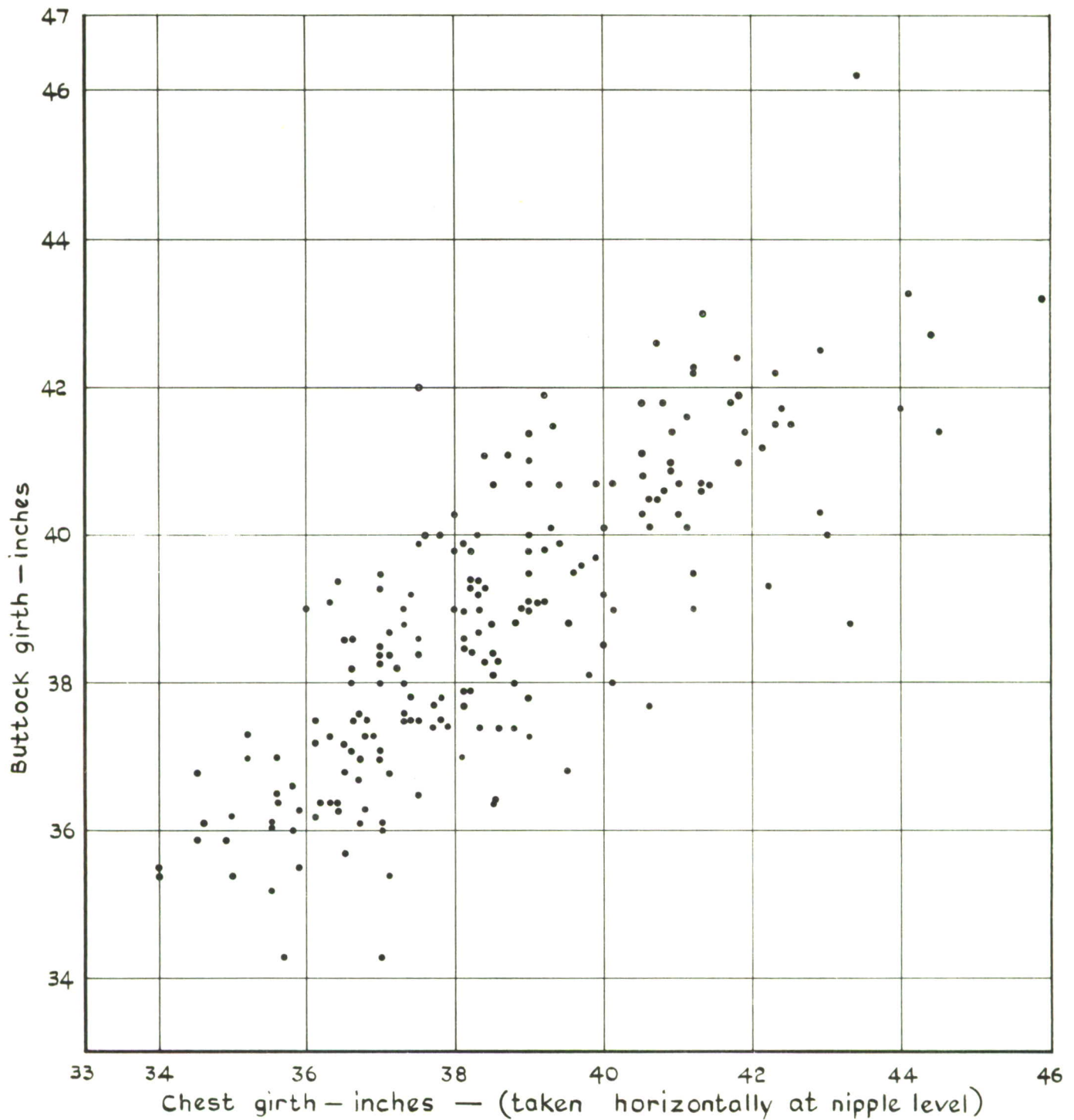


Fig.18 Chest girth/ buttock girth

Fig.19 & 20

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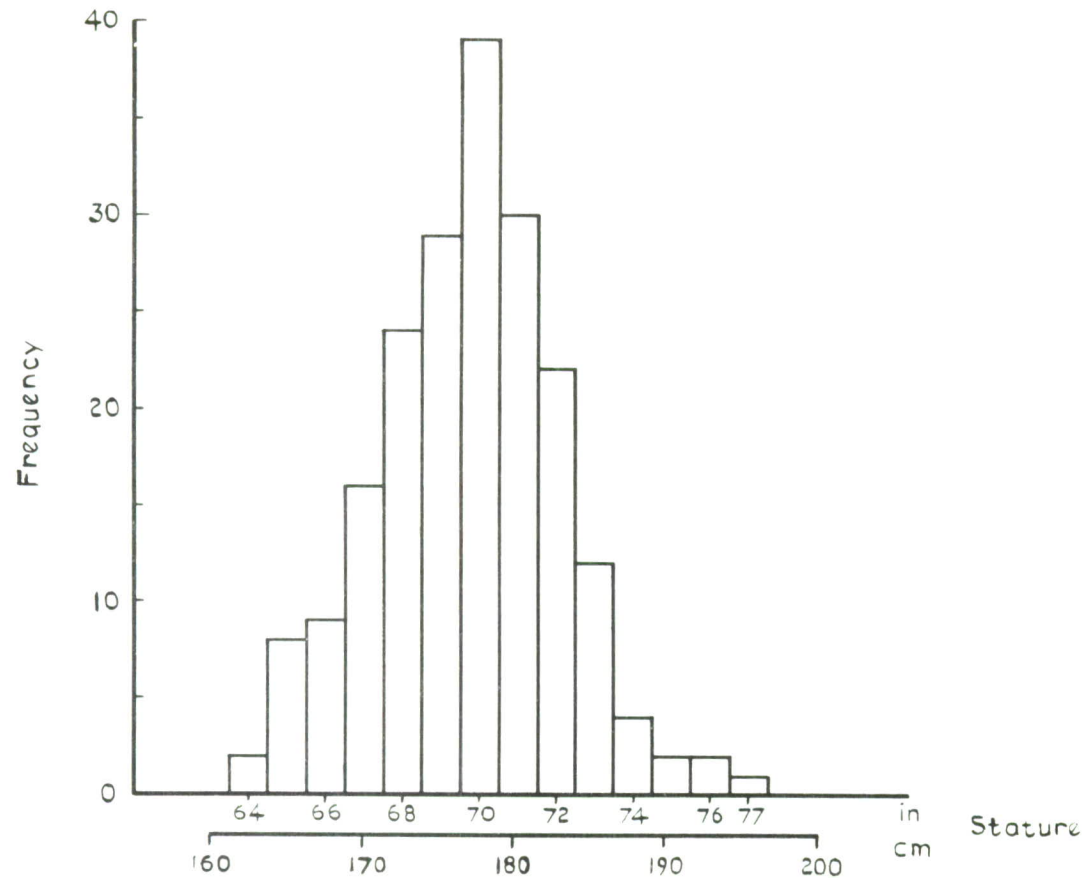


Fig.19 Frequency distribution—stature

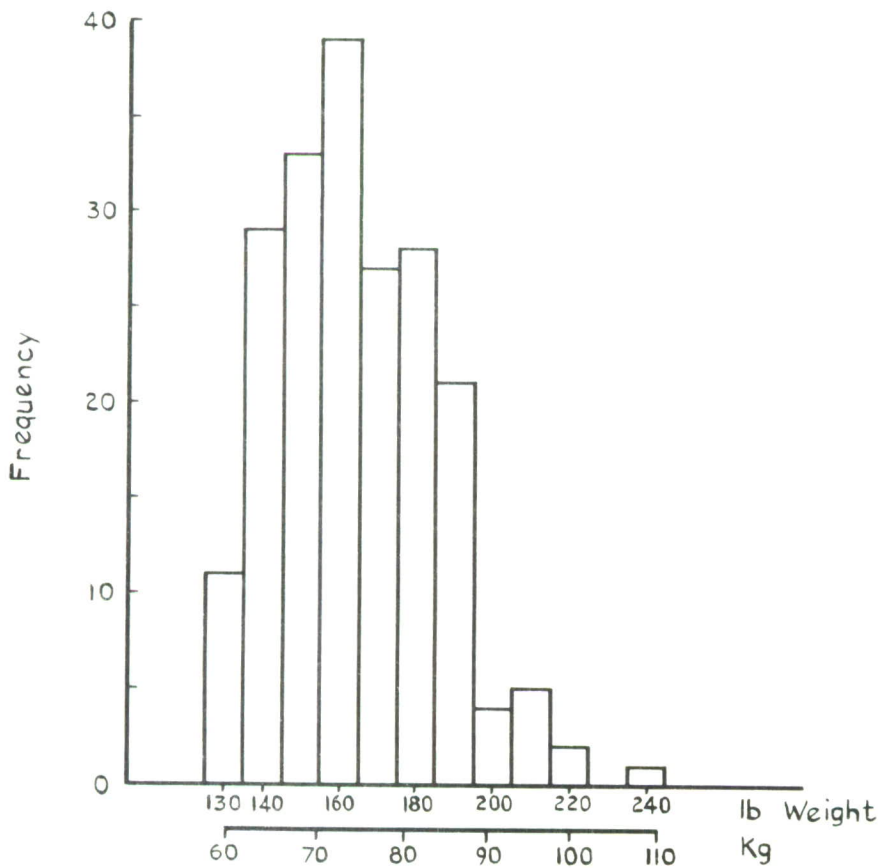


Fig.20 Frequency distribution—weight



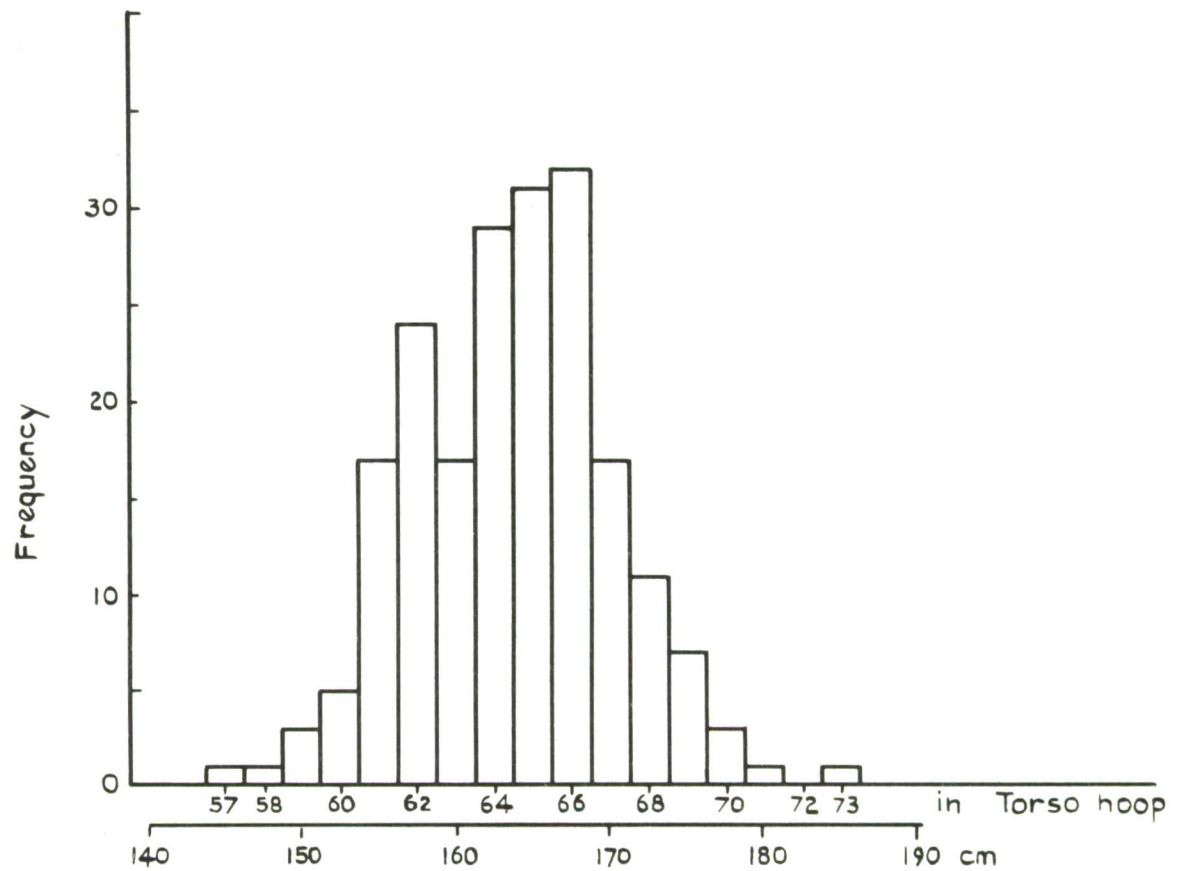


Fig.21 Frequency distribution—torso hoop

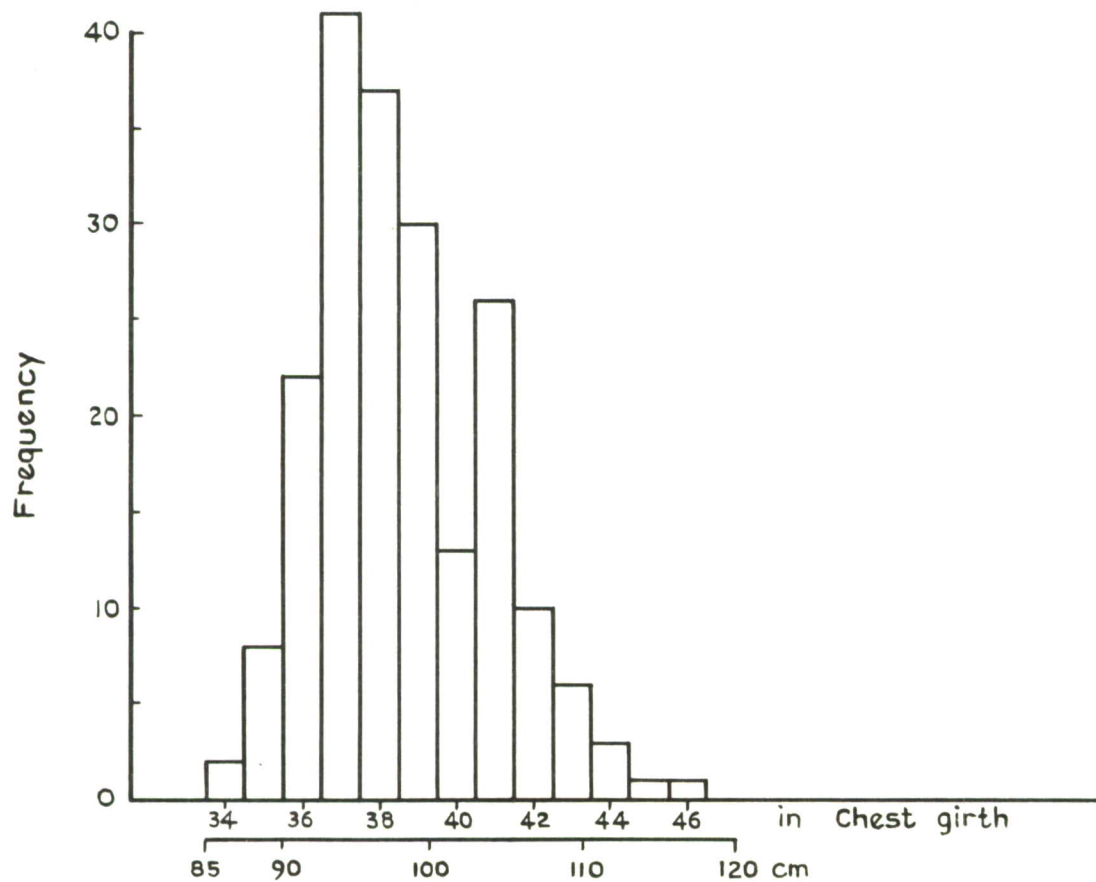


Fig.22 Frequency distribution—chest girth

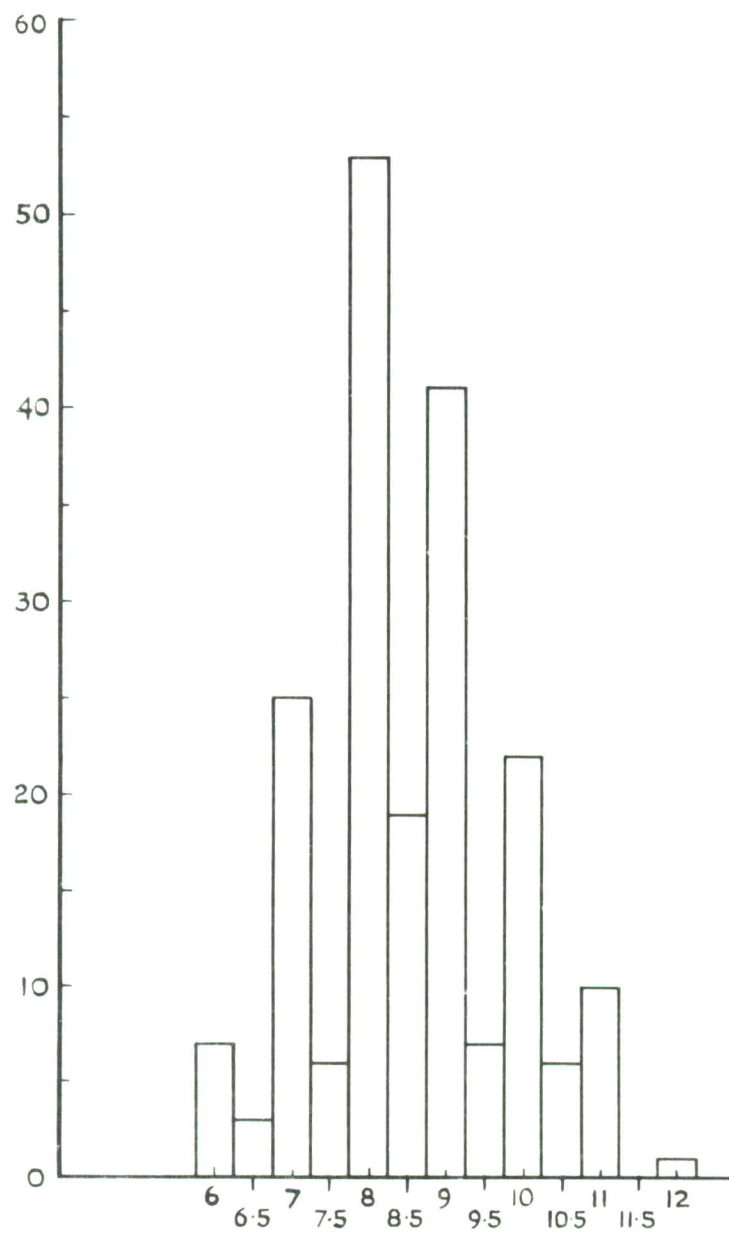


Fig.23 Frequency distribution—Shoe size  
Shoe sizes are given as stated by the subjects  
No foot measurements were taken





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